

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1892, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXVII.—No. 19.]

ESTABLISHED 1845.

NEW YORK, NOVEMBER 5, 1892.

[\$3.00 A YEAR.
WEEKLY.]

THE MANUFACTURE OF WIRE GLASS AT TAConY, PHILADELPHIA, PA.

The subject of protecting glazed skylights is one which of late years has acquired additional importance. The construction of large railroad depots illustrates the tendency of the day. In such structures as the Grand Central Depot in this city, light is given to the interior by large skylights. These are placed in the roof of the building and are of very large area. At a height of nearly a hundred feet above the floor they are a constant menace to life. The glass used in their construction is necessarily of considerable thickness. If it breaks and falls, the heavy sharp-edged pieces are perfectly capable of inflicting a fatal blow. If a piece were to fall upon a car roof it would very probably cut its way through, and embed itself in the bottom of the car if it did not go through that also. The force of the blow of course depends on the size of the piece. Some extraordinary accounts have been given of the penetrative power of glass which has actually fallen from such a skylight.

To prevent accidents of this kind a copper wire network is often stretched over the framework of the skylight directly under the glass, or in some equivalent position, with a view of catching any pieces which may be detached or broken loose. This is a partial solution of the difficulty only. The wire gauze is liable to cor-

rode, or its fastenings may become loosened, so that it may be quite useless. Corrosion is especially to be feared in railroad stations and train sheds. The gases from the locomotive smokestacks is a source of corrosion, as the sulphurous fumes attack both copper and iron. In such situations also it is found that large sheets of glass tend to crack.

We illustrate an experimental plant for the production of wire glass, a substance designed to overcome these difficulties. The product consists of rolled glass, with iron wire netting embedded in its own substance. Thus the wire is hermetically inclosed, and is secure from corrosion for any length of time. The machine and process is the invention of Mr. Frank Shumann, of Philadelphia, Pa. At the works illustrated in our cut, as much as ten tons of the material was produced. The glass made under the conditions incident to experimental appliances was so perfect, and of such obvious merit, that it obtained the fullest appreciation from the architects and engineers of the country. Work is now in active progress on extensive plant and buildings for the production of the new material in commercial quantities.

The general principle of operation is as follows:

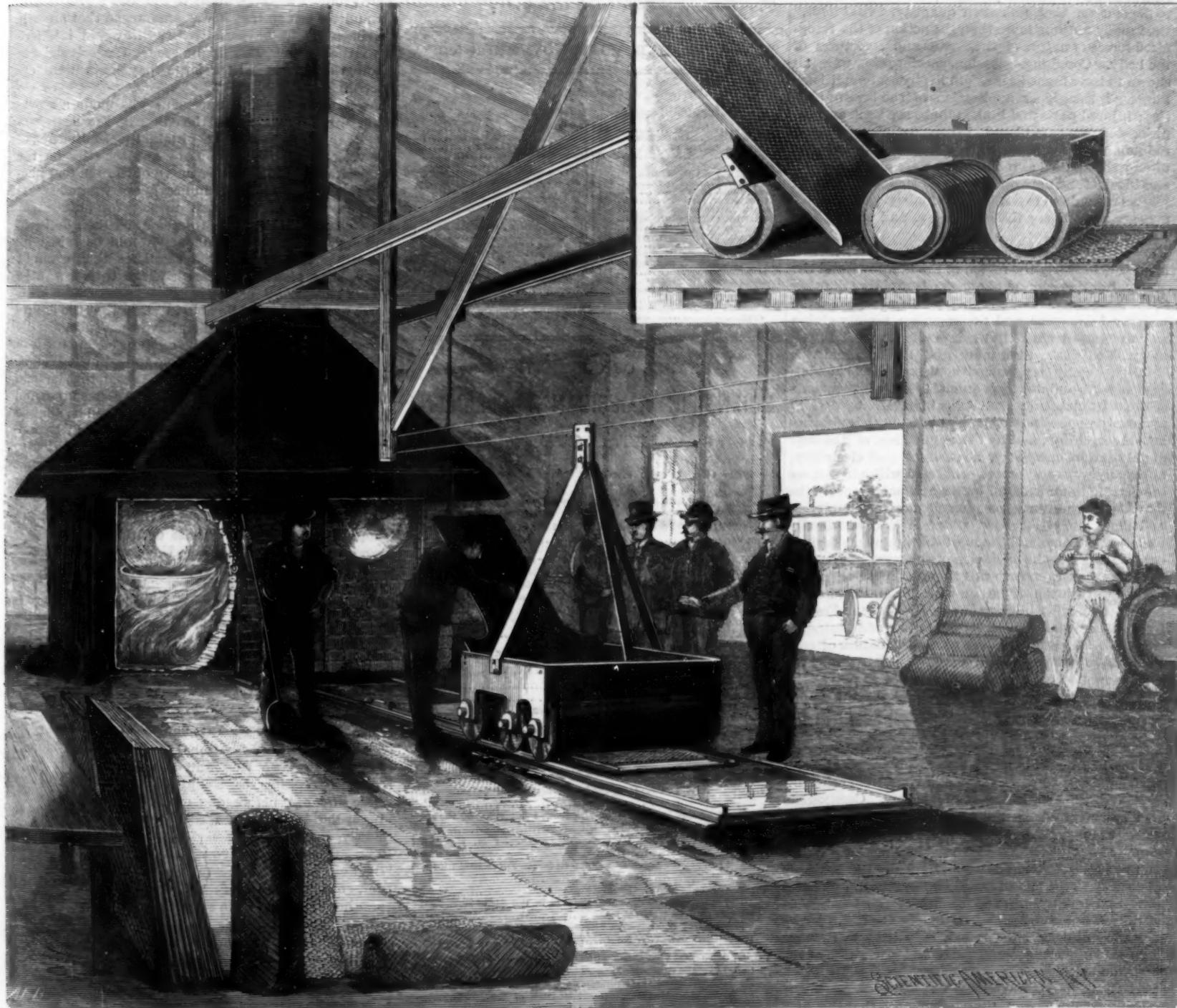
A glass rolling table with side ledges is provided. A three-roller carriage moves over it, running on the side ledges. The glass is rolled out upon this table, the

ledges regulating its thickness. Two of the rollers are smooth; the central roller has a series of grooves running around it. Between the leading roller and the corrugated roller a slide is placed for the reception of a sheet of wire gauze. Arrangements are provided for traversing the rollers from end to end of the table.

The rollers are hollow, and, in the experimental plant, red hot iron cores are introduced in them to heat them.

The glass has been melted in an adjacent furnace. The sheet of wire gauze is heated, and all is ready for the rolling. A proper quantity of melted glass is poured out upon the table, the hot sheet of wire gauze is placed in its carrier, and the roller carriage is started. As the carriage progresses a little, the wire is dropped. The first roller has rolled out the glass. The wire gauze strikes the partly fluid glass, and is drawn under the corrugated roller. This seizes it, and by its corrugations forces it into the pasty glass to the required depth. The compound mass then goes under the third roller, where it is rolled smooth, and the operation is completed. The sheet is now annealed in the usual way, and is ready for use.

By modifications in the apparatus various products may be obtained. The wire gauze may be heated so hot as to receive a corrugated contour, which it retains in the glass. It may on the other hand be worked at



THE MANUFACTURE OF WIRE GLASS AT TAConY, PHILADELPHIA, PA.

so low a temperature as to lie quite flat in the finished product. The corrugated roller may be adjusted to give it any desired depth in the glass.

Sheets of wire glass six feet long, two feet wide and three-eighths of an inch thick have been rolled at the experimental plant in thirty-five seconds.

The American Wire Glass Co., of Tacony, Philadelphia, Pa., has been formed to exploit this invention. By the beginning of next year they expect to have in active operation their factory already alluded to, with a daily capacity of about 5,000 square feet of wire glass. The most improved appliances are to be used, so as to render the operations as nearly automatic as possible. Gas fuel will be used and the rollers will be heated by the same.

The new product has other uses than those mentioned. It is to some extent burglar proof. It is not known what is the heaviest wire which can be used, but it is obvious that glass several inches thick with one or two sheets of heavy steel wire gauze embedded in its center would be very resistant to any attacks by burglars. For pavement lights it is also applicable, as it has great weight-sustaining power. A heavy man can walk and jump on one of the sheets made in the experimental works. Last not least is its power of resisting projectiles. It can be made so that a pistol ball will not penetrate it, thus affording a material for windows and other lights which will be secure from all ordinary missiles.

Science in Medicine.

The recent address at St. George's, London, was delivered by Dr. Bowles, of Folkestone. The lecturer commenced by welcoming the new students, and urging them all to preserve the tradition that "a St. George's man is expected at all times and under all circumstances to be a gentleman." The apprenticeship system was announced to be dead—defeated by the rapid march of science. This led to the main subject of the address, "the application of physics to physic." It was pointed out that all changes occurring in physiological and pathological processes, formerly supposed to depend on that unknown quantity, "vital force," were really nothing more than the action of the recognized forces of nature on the organs and structures of the body. Coughing, sneezing, snoring, etc., were all shown to have immediate origin in physical conditions. Surgery is the proper application of the laws of physics; injured parts and broken limbs are kept at rest, dislocated parts are placed in their natural positions, redundancies are removed, and natural deficiencies often well supplied; crooked paths are made straight, and blocked and narrowed ones made patent; stiffened joints are made to move, crooked limbs put into shape, eyes are made to see that would not, and ears to hear that could not.

Surgery is a department of physics—a physical art. Medicine, formerly the region of the unknown and the happy hunting ground of quacks, is rapidly following in the same lines. The so-called practical man and the believer in dogmas and nostrums are rapidly giving way to minds trained in the laws of physics. Physiology, Medicine's forerunner and its handmaid, is steadily, step by step, and without prejudice, elucidating the ways and doings of animal life. By instruments of the most elaborate and delicate nature, by patient and continuous observation, by anatomical and histological searchings, and by the application of the laws of gravitation, chemistry, heat, light and electricity, always by ways and means connected with physics, we are getting to understand better and more surely the movements and functions of respiration, of circulation and digestion, of secretion and excretion, and finally we hope to understand the most subtle and mysterious of all functions—the operation of the nervous system.

The lecturer then reviewed the rapid progress made in late years in the studies on which the medical art is based. Schroeder in Germany and Pasteur in France, by their investigations on fermentation and putrefaction, and Chauveau on the particular nature of contagia, have opened up an entirely new world. We have now not only to study the causes as well as the changes of the disease in the body, but also the doings of the bacteria outside the body and within it. In view of the more scientific methods of modern pharmacology and therapeutics, students were cautioned against long and complicated prescriptions. Not a single drug ought to enter the body except under clear intention of what object it is to fulfill there. Compounds may be good cookery, but do not form scientific medicine. Finally, students were warned against mistaken views of materialism. The students of the physical and biological sciences are emphatically the servants of nature. The man of science interprets the physical laws, and equally with the teacher of religion tells us of the greatness and grandeur of the Creator. Every discovery of the scientist can only tend to increase our wonder at the omniscience and perfection of the ways of God.

PROFESSOR C. A. YOUNG announces that the fifth satellite of Jupiter has been seen by his assistant, Mr. Reed, with the 20 inch equatorial, at Princeton.

Scientific American.

ESTABLISHED 1845.

MUNN & CO. Editors and Proprietors
PUBLISHED WEEKLY AT
No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico. \$3.00
One copy, six months, for the U. S., Canada or Mexico. 1.50
One copy, one year, to any foreign country belonging to Postal Union. 4.00
Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$6.00 a year for the U. S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies 25 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Columbia River.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, \$10.00 a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with scientific plates, showing descriptive drawings, plans, buildings and structures, works in progress, etc. To building and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, \$6.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$9.00 a year. To foreign countries, \$11.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. \$3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers, 361 Broadway, New York.

EW The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

EW Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, NOVEMBER 5, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)			
Holler room mistakes.....	200	Medicine, science in.....	200
Books and publications, new.....	200	Medicine, scientific research in.....	200
Bridge, Brooklyn railway, capacity.....	200	Natural history notes.....	200
Cat heating, steam.....	200	Notes and queries.....	200
Cellophane, negative, varnish for.....	200	Paint, Lender's.....	200
Cheese.....	200	Paper making, something about.....	200
Cotton sheet, Legge's.....	200	Pestilence, African, what of.....	200
Fair, the, after dedication.....	200	Photographic developer, amidol.....	200
Glass, wire, manufacture of*.....	200	Photographing vowel sounds.....	200
Gooseberry rates.....	200	Photography at the fair.....	200
Gen trials, interesting.....	200	Railway station, Philadelphia*.....	200
German rubber, artificial.....	200	Sea sickness.....	200
India rubber, artificial inventions, recently patented.....	200	Shoe lace, etc.....	200
Kerite.....	200	Steamer, Attention Given to.....	200
Launch, steam, the fastest.....	200	Stereoscopic prints, transferred.....	200
Magnets, great, experiments with.....	200	Telephone, New York-Chicago*.....	200
Mechanical improvements recent.....	200	Thinking, the art of.....	200
		Trees, ornamental, removing.....	200
		Tripe.....	200
		Waterworks, Plainfield, N. J.*.....	200
		Wire glass, manufacture of*.....	200

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 879.

For the Week Ending November 5, 1892.

Price 10 cents. For sale by all newsdealers.

I. ELECTRICAL.—Portable Accumulators for Stage Effects.—3 engravings.....	1604
II. ENGINEERING.—Aberration Problema.—A lecture on "The Motion of the Ether near the Earth."—By Dr. OLIVER LODGE, at the Royal Institution.—10 engravings.—An interesting article.....	1605
Compound Express Engine.—Paris, Lyons, and Mediterranean Railway.—2 engravings.....	1606
Roberval's Method of Drawing Tangents.—By Professor C. W. MACCORD, Sc.D.—A full article.—11 engravings.....	1607
III. HORTICULTURE.—The Fall Flowers of Autumn.....	1607
IV. MEDICAL AND SURGICAL.—Vertigo.—A paper read before the Medical Society of Virginia.....	1608
Removing the Vermiform Appendix.....	1608
Solophen.—A new remedy for rheumatism.....	1608
V. METALLURGY.—The Cohesive Property of Gold—Its Character, Value, and Availability.—By S. H. GUILFOORD, D.D.S., Ph.D., Philadelphia, Pa.—A paper read before the joint union meeting of the Pennsylvania and New Jersey State Dental Societies.....	1609
VI. MISCELLANEOUS.—Genoa—The Birthplace of Columbus.—1 large engraving.....	1607
Crypt of the Royal Chapel, Granada.—1 engraving of the sepulchers of Ferdinand and Isabella.....	1607
The Future of the Gutta-percha Supply.—By M. EUGENE SERULLAS.....	1608
The Days of the Week of any Given Date.—For 60 centuries.—A valuable paper.....	1608
Training of Horses.—11 engravings.....	1609
The Determination of Carbon Dioxide in the Air of Buildings.—By AUGUSTUS H. GILL, Ph.D.....	1609
Peroxide of Sodium.—An interesting article.—By M. PRUD'HOMME.....	1609
VII. TECHNOLOGY.—Paper Testing.—An exhaustive article, giving tests of tensile strength of papers.—Calculation of the "breaking strength."—Resistance to rumpling and rubbing.—Mineral residue of papers, ash.—Microscopical examination of papers.—Qualitative tests for wood pulp in paper.—Quantitative determination of ground wood in paper.—Determination of the kind of sizing.—Determination of the amount of sizing.....	1609
Frame for Singeing Cotton Thread.—2 engravings.....	1609

NEW YORK AND BROOKLYN BRIDGE CABLE RAILWAY OPERATIONS DURING THE WEEK OF THE COLUMBUS FESTIVAL.

Never was the bridge so crowded with people as during the gala days of the Columbian anniversary. Commencing on Sunday, October 9, 453 trains were dispatched, 392 of which had a headway of from 8 to 2 minutes.

On Monday 549 trains were dispatched, 120 of which had but 1½ minutes' headway. Tuesday, 558 trains, 212 at 1½ minutes' headway. Wednesday, the rush day, 697 trains were dispatched, of which 346 were on 1½ minutes' headway. The number of passengers carried was, on Sunday 99,300, Monday 188,677, Tuesday 158,085, and on Wednesday 223,625, gradually falling off to the normal number at the end of the week. The whole number for the week was 1,091,539. The greatest rush was from Wednesday, 8:15 A. M., until Thursday, 8:15 A. M., 24 hours' continuous run of the cars carrying 258,593 passengers.

The speed of the cable is 10½ miles per hour; it is 1½ inches diameter, and 12,000 feet long. It wears out in about 15 months, having a haulage service of about 20,000,000 ton miles. The greatest recorded work of the cable engines is 1,000 horse power. Cars weigh from 17 to 19 tons, and there are 60 in service, 48 running during rush hours. The above enumeration only includes railway passengers riding by ticket. The immense throng by the foot and roadway can only be estimated, and probably reached the number of 200,000 or more, making the total travel over the bridge on Wednesday, October 12, nearly half a million people. Not the slightest accident is known to have occurred. When we consider that one-half of the immense train service of Wednesday was run on 1½ minutes' headway, without a break, we cannot but accord the highest praise to its management.

PHOTOGRAPHY AT THE WORLD'S FAIR.

When the question of granting photographers the right to photograph, for a small fee, at the World's Fair grounds was submitted to the Ways and Means Committee last spring, it was announced that no such privilege would be permitted, as it would interfere with the parties who might secure the sole right to photograph, from whom large payments were expected.

As soon as this announcement was made, a movement was inaugurated by the editor of the *American Amateur Photographer* to obtain the sentiments of the various photographic clubs and societies on the proposition to exclude the camera of the amateur photographer, which resulted in nearly every organization disapproving the idea and urging the authorities, through special petitions, to reconsider their decision, on the ground that more money would be raised by admitting the camera at a small fee than could be derived by restricting the privilege to a few at a higher charge.

We are gratified to be able to state that the desires of the amateur photographers have been substantially acceded to. It was officially announced on the 25th of October by the official photographer of the World's Columbian Exposition, Mr. C. D. Arnold, that on and after that date "Hand cameras using plates up to and including 4 x 5 inches, without tripods, will be allowed within the grounds of the World's Columbian Exposition, on payment of a fee of two dollars in addition to the regular price of admission for each day. Cameras using stereoscopic lenses will not be admitted, however small the plate may be."

This decision practically opens the grounds to photographers and will enable those desiring to secure photographs for themselves from their own point of view to do so. It is we think very creditable to the World's Fair authorities that they have decided to grant some concessions to the amateur photographers, and will undoubtedly be the means of greatly increasing the amount of free advertising the fair will get, while the manufacturers and dealers in photographic materials will also greatly profit by the increased demand for their goods.

Photographing the Sound of Vowels.

At the recent International Congress of Physiology at Liege, Professor Hermann demonstrated his method of photographing the sound of vowels. The vowels were sung out before one of Edison's phonographs. Immediately afterward they were reproduced very slowly, and the vibrations recorded by a microphone. The latter was furnished with a mirror, which reflected the light of an electric lamp upon a registering cylinder, covered with sensitized paper and protected by another cylinder with a small opening which gave passage to the rays of light from the reflector. By this means was obtained very distinct photographic traces, and the constancy was remarkable for the different letters.

A MINE ON FIRE SINCE 1858.—The burning mine at Summit Hill, near Mauch Chunk, Pa., has been on fire since 1858.

The World's Fair after the Dedication.

After the great success which attended the dedicatory exercises at Chicago, a lull in the work of the fair seems to have ensued. This, however, is but an appearance. After the celebration was over, and after the troops from all parts of the country had returned or were *en route* to their respective homes, the public attention has been directed to other channels. But the impressiveness of the recent ceremonies grows as they are thought over. The great building, with the thousands of spectators, the band and chorus, the presence of so many eminent civilians, army and navy representatives, members of diplomatic corps, and the like, was a worthy step in the way of progress of the great work. After the interruption caused by the proceedings the operations are again actively under way. The prospect is that America will produce not only an unequalled exposition of arts and industries, but that it will be conceived and executed in a period of time unequalled in brevity for such an affair.

The location of the site for the buildings is a very recent event. Even the chosen city was an object of speculation until within a few months, and already the city of the lakes has shown that her enterprise and energy are more than a matter of reputation. The buildings are nearly complete. Probably the greatest assemblage of spectators ever gathered under similar conditions under one roof were witnesses of the progress already made. They found many of the great structures practically ready for occupancy. The participants and spectators in general saw a great part of a veritable city of industry rising from the plain.

The buildings harmonized well with the mass of humanity surrounding them. The route of the military procession, as it wound through the grounds, was overshadowed by the buildings. These formed a fitting background for the military parade. The water and bridges and other features of the grounds added to the picturesque effect.

Another element of interest was incident to the occasion. For the first time the grounds and buildings appeared with their proper concomitants of a great assemblage. The effect of the structures is not to be judged of as they stand isolated and untenanted. But when the isolation is destroyed by surrounding crowds, and when their interiors are filled with an immense concourse of people, some judgment can be reached as to what the final effect will be. In this aspect the celebration possessed peculiar interest. The suitability of the edifices for human occupancy was tested. Their adaptability and power of harmonizing with a mass of humanity seemed perfect. The sense of desolation that the enormous empty structures have hitherto inspired was done away with. The hum of life gave a new and, as yet, unseen aspect to the scene; for, until the celebration, so great an audience had never tenanted the great hall, and so many people had not yet visited the grounds in one day.

We have alluded to the scope of the celebration. The exposition commemorates an event in the world's history. It is no national or municipal event that has called forth the fair. America felt that her turn had come in the family of nations to hold an exposition. The lapse of four hundred years has produced the anniversary it celebrates. Unequalled in this feature, it is to be hoped that all will progress to a favorable issue. That such will be the case it is hard to doubt. So much has been done that the future is secure. The fair will be in fact as in its origin a celebration worthy of its historical anniversary.

Amidol—a New Photographic Developer.

When, in the fall of 1889, we found that eikonogen was what may be termed a universal developer, working equally as well in the development of negatives and positives either on plates or paper, we were certain that further improvements would be made, as the introduction of hydroquinone and eikonogen opened a new field in developing agents. Previous to that time the ferrous oxalate and pyro developers were used almost exclusively. Last year the para-amidophenol developer was introduced, and was accelerated in its action by the use of a caustic alkali or a carbonate, particularly carbonate of potash.

The claims for these improved developers were that they possessed unusual oxidizing power on the gelatine bromide film, but would not, even in prolonged development, cause it to stain.

The newest chemical of the same class is called "amidol," which is a diamidophenol. It has lately been introduced into this country, and possesses unusual characteristics as a photographic developer. It is supplied in minute grayish white crystals, resembling those of hydroquinone. It is almost as soluble in cold water as pyro, and requires no other accelerator to produce developing action than the sodium sulphite, so long used as a preservative in other developers. A plain solution of amidol dissolved in distilled water tests acid with blue litmus paper. By itself, poured on a plate having had a time exposure, after five minutes' action no image is discernible; but by adding a solution of sodium sulphite until there is an equivalent

of three grains of sulphite to one of amidol, development at once gradually begins and continues steadily until the negative is completed. The solution made in these proportions also tested slightly acid. These facts were ascertained after several experiments.

It is advisable to use only rain, melted ice water or distilled water, as water containing a lime or a similar alkali produces a turbidity and a precipitate. The strength of the solution recommended by the manufacturers is, in our opinion, too great for convenient working, and instead of mixing the amidol and sulphite in one solution we prefer to mix the amidol fresh each time it is desired to develop a batch of plates. The following method may be recommended: First, prepare a stock solution of neutral sodium sulphite:

Sodium sulphite.....	100 grs.
Water.....	1 oz.

To make a two ounce developer, dissolve eight grains of amidol in one and three-quarter ounces of water, then add two drachms and a half of the sodium sulphite solution, pour this combined solution on the plate. If no action is observed after a minute's time add half a drachm more of the stock solution; continue these additions *ad libitum* until the developer works up to the rapidity desired. By operating gradually in this way, an overtime plate may be developed perfectly without the addition of a bromide.

Amidol dissolved in distilled water changes from a colorless solution in three hours to a dark clear ruby red. The sulphite acts as a preserver and as an accelerator. A solution having 100 grains of sulphite to 10 grains of amidol in distilled water changes in an open graduate exposed to the air from a colorless solution to a deep orange in a week's time. In either case the sulphite keeps the solution clear.

The formula recommended by the makers is:

Amidol.....	80 grs.
Sodium sulphite.....	80 "
Water.....	8 oz.

To form the developer the above is diluted from three to four times and a few drops of bromide may be added if desired to check development.

Taking two ounces of the above strong solution, we added thereto in a graduate six ounces of water, which gave a solution of amidol equivalent to about three grains to the ounce. With this eight ounces we developed perfectly in a few minutes ten 10 x 12 bromide prints.

The rapidity of this developer, as well as its absolute freedom from stain, are its remarkable features, and bring it up to an equal with the iron developer used in the wet plate process. It acts as rapidly on a shutter-exposed plate as one having a time exposure, and builds up the density with equal rapidity, thereby producing easily brilliant negatives. For all kinds of plates or bromide paper it appears to be the most simple and perfect developer yet devised. For lantern slides it is admirable, giving high lights in clearness equal to the wet plate, while the density is regulated by the amount of amidol in the developer.

We developed a shutter-exposed plate in less than two minutes to full density where usually it takes ten. It will be seen also that no alkali is required, in fact an alkali added to a plain solution of amidol, after being on a plate for five minutes, produces no result except to oxidize the solution and turn it quickly to a deep ruby red. The new developer is one of the best improvements that has been made.

Cheese.

Experiments have been made at the New York Agricultural Experimental Station in conjunction with the New York State Dairy Commission.

The details of these experiments are given in the Bulletin No. 48, published at the Geneva Station, N. Y., from which we cull the following summary:

Fat.—The amount of fat lost in the whey increased in some cases and decreased in others, when the amount of fat in the milk increased.

The average amount of fat lost in the whey in all the experiments was 0.20 pounds (about 4½ ounces) for 100 pounds of milk, which was about 7.5 per cent of the fat in the milk. In the factory experiments, the average loss of fat was about 9 per cent of the fat in the milk; while, in the station experiments, the average loss was about 7 per cent of the fat in the milk.

Casein and Albumen.—The amount of casein and albumen lost in the whey increased quite uniformly when the casein and albumen in the milk increased.

The average amount of casein and albumen lost in the whey in all the experiments was 0.74 pound (about 12 ounces) for 100 pounds of milk, averaging 0.64 pound in the factory and 0.81 pound in the station experiments. From 23.5 to 24 per cent of the casein and albumen in the milk was lost, the proportion of loss being quite uniform in all the experiments.

Of the 0.74 pound (or 12 ounces) of casein and albumen lost, 0.15 pound (about 2½ ounces) consisted of casein and 0.59 pound (about 9½ ounces) of albumen. About 6 per cent of the casein and 82 per cent of the albumen in the milk was lost, on an average.

In the various lots of milk used there were, on an average, 2.4 pounds of casein and 0.72 pound of albu-

men, or for every pound of albumen there were about 3.3 pounds of casein.

The proportion of fat in the cheese increased, as a rule, when the amount of fat in the milk increased, but the increase of fat in the cheese was not uniform with the increase of fat in the milk. Green cheese, made from factory milk that contained about 8 pounds of fat in 100 pounds of milk, contained about 33 pounds of fat in 100 pounds of cream. Cheese made from whole milk, to which cream had been added, and which contained 6 pounds of fat in one hundred pounds of milk, contained 42 pounds of fat in 100 pounds of cheese. Cheese made from milk containing about 3.55 pounds of fat in 100 pounds of milk contained about 35 pounds of fat in 100 pounds of cheese. When the milk contained about 4.25 pounds of fat in 100 pounds of milk, the cheese contained from 36 to 36.5 pounds of fat in 100 pounds of cheese. In case of milk, partially skimmed, containing 3.56 pounds of fat in 100 pounds of milk, the cheese contained nearly 32 pounds of fat in 100 pounds of cheese.

Basing a comparison of results upon the water-free cheese, instead of green cheese, we obtain results that are quite similar in their relations.

In general, the fat exercised a greater influence upon the composition of the cheese than any other constituent of the milk.

In the cheese made from the normal milks, the amount of casein and albumen in one hundred pounds of cheese was a fairly uniform quantity, varying in the green cheese from 22 to 24 pounds and in the water-free cheese varying from 36 to 38 pounds. The milks containing least fat made cheese containing a little more casein and albumen. Skimming the milk partially increased largely the amount of casein and albumen in the cheese, while adding cream to whole milk diminished the amount of casein and albumen in the cheese.

The results appear to indicate that in cheese made from normal milk containing from 3 to 4.25 pounds of fat in one hundred pounds of milk, there should be about 1.4 pounds to 1.5 of fat for one pound of casein and albumen in the water-free cheese. Partial skimming reduced this ratio to 1.22 pounds, while addition of cream raised it to over 2 pounds.

Of the increased yield of cheese obtained in the various experiments, nearly one-half of the increase, on an average, was due to an increase of fat in the milk from which the cheese was made.

The amount of fat retained in the cheese made from one hundred pounds of milk increased when the amount of fat in the milk increased, but not with exact uniformity.

On an average, the increase of casein and albumen in the milk produced a little over one-fifth of the increased yield of cheese observed in the various experiments.

The amount of casein and albumen retained in the cheese made from one hundred pounds of milk increased quite uniformly when the amount of casein and albumen in the milk increased.

Water.—About one-third of the increased yield of cheese was due to an increased amount of water retained in the cheese.

The amount of water retained in the cheese made from one hundred pounds of milk was quite variable, and increased when either the fat or casein and albumen in the milk increased.

Pounds of Cheese Made from Milk.—Of the factory milk, there were required, on an average, 11.4 pounds to make one pound of cheese.

Of the station milk, 8.8 pounds sufficed to make one pound of cheese.

The low yield of cheese from the factory milk was mainly due to the small amount of fat, casein, and albumen contained in it, that is, to the poor quality of the milk; and, in addition, the loss in manufacture was a little greater. The poor quality of the milk was probably due to the fact that the cows were in the earlier stage of their period of lactation.

Variation in Amount of Rennet Used.—In two sets of comparisons, only one case showed any difference in loss of fat, casein, and albumen, and this was when the amount of rennet used was much less than the usual amount. No difference of yield was shown that could be attributed to variation in the amount of rennet used.

Cutting Curd in Hard and Soft Condition.—In two sets of comparisons, one case of soft cutting gave a little larger loss of fat and casein. In one case the soft cut curd gave a little larger yield, owing mainly to the retention of more moisture.

The loss of weight varied, for the first month, from 5.5 to 8.87 pounds, and averaged 6.95 pounds for each hundred pounds of green cheese.

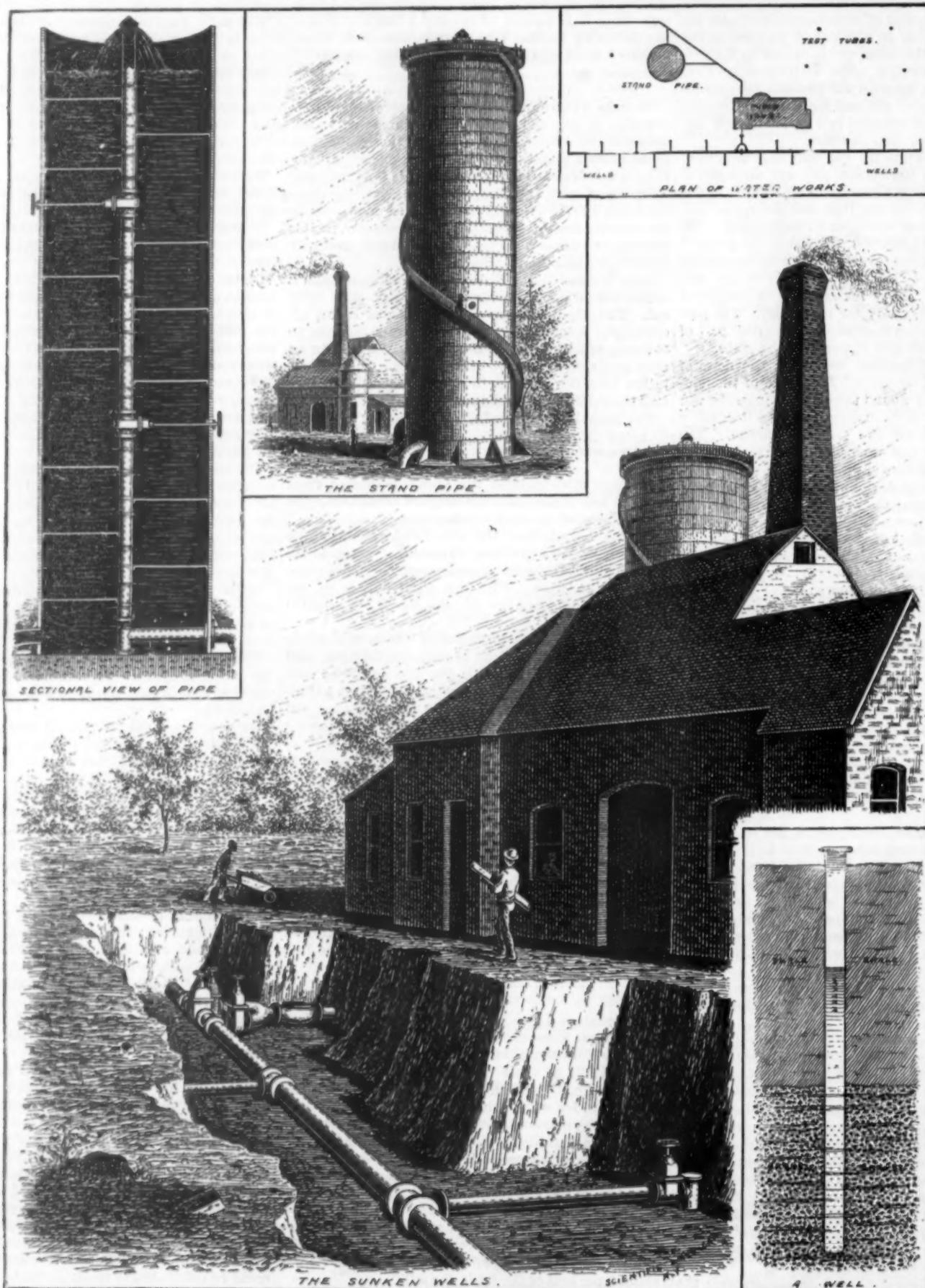
ORDINARY grated horse-radish, eaten at frequent intervals during the day and in connection with food at the table, if food is eaten at all, has been found remarkably efficacious in banishing the distressing cough that frequently lingers after all the other symptoms of the grip have gone. It can do no harm to try it, at all events.

PLAINFIELD, N. J., WATER WORKS.

An underground river, with the clearest and purest of water, has been discovered near the city of Plainfield, N. J. A few months ago the water company began to drive wells, and, after going over about five square miles of country and striking inferior qualities of water, they struck pure water at Netherwood Station, on a line with the Central Railroad, two miles this side of the city, at the depth of fifty feet. Here they sunk a number of wells, and then made a test. After pumping seven days and nights, drawing out of

to it by a 6 in. pipe. At the center of the 12 in. pipe are three large valves which turn the water on or off from the pumping station, a small valve being also attached to each well. Each well has at its bottom a 12 ft. strainer. The earth through which these wells are driven is a hard shale, running down to a depth of 27 ft. It is so compact that no drainage or surface water can get through it, and below it is a bed of sand and gravel, through which the pure and clear water flows. The wells run down to the depth of 20 ft. into this bed, the gravel in which is smooth and polished,

falling down into the stand pipe. This 20 in. pipe is securely braced to the sides of stand pipe with angle iron braces bolted to the sides, and has two valves, one at 50 ft. and the other at 100 ft. from the ground, which can be opened and closed from the outside of stand pipe. The foundation for the stand pipe is 10 ft. in depth and 33 ft. in diameter, and is made of cracked stone and cement, 10 ft. bolts, 2 in. in diameter, securely fastening the stand pipe to the foundation. This pipe holds 515,000 gallons, and has a pressure at the bottom of $62\frac{1}{2}$ lb. There is a fall of 25 ft. from the



NEW WATER WORKS AT PLAINFIELD, N. J.

the earth 2,000,000 gallons of pure water every twenty-four hours, and their test tubes showing no decided fall, it was concluded that they had an inexhaustible supply. Twenty six-inch wells were then sunk to the depth of 50 ft., the wells being about 50 ft. apart and sunk in a zigzag manner for a distance of 1,000 ft. Running between these wells is a pipe, which is attached to the end wells. This pipe is 6 in. at the ends, increasing in size as it runs toward the center up to 12 in., changing in size about every 195 ft. Each section of pipe rests on two saddles, the saddles fitting over the top of a post 3 ft. in length, which rests on a foundation of lumber 8 ft. square. The wells are about 8 ft. from this pipe on each side and connected

showing that the water is constantly moving. The natural force of this underground river brings the water up to within 18 ft. of the surface. Two Worthington compound condensing pumps with 18 in. stroke are used for drawing water from the wells and forcing it up into the stand pipe. The pumping capacity of these pumps is 5,000,000 gallons every 24 hours, and the pumps are run with 80 lb. pressure of steam. The stand pipe is 25 ft. in diameter and 140 ft. in height, and is made of wrought iron plates of four different sizes $\frac{3}{4}$, $\frac{5}{8}$, $\frac{3}{8}$, and $\frac{5}{16}$ in., in twenty-eight tiers and double bolted. The water is forced up through a 20 in. pipe, running up the center of stand pipe, to a height of 144 ft., the water flowing over the top and

station to the city of Plainfield. There are twenty-seven miles of pipe laid in the city. Water is also furnished to the city of Elizabeth, N. J., to the extent of 1,500,000 gallons daily. The water analysis is: Total solid, 8.86; chlorine, 0.44; free ammonia, 0.001; albumenoid, 0.0058; and the temperature of the water as it comes from the wells is 52 degrees.

The cost of the water works is about \$450,000.

A NEW material, called rubber velvet, is made by sprinkling powdered felt of any color over rubber cloth while the latter is hot and soft; the result looks like felt cloth, but is elastic, waterproof and exceedingly light.

Lake Steamers.

The Owego is the fastest steamer on the lakes, having made the run from Buffalo to Chicago, 889 miles, in 54 hours and 15 minutes—16 1/4 miles per hour. With her sister ship, the Chemung, she has the finest coefficient of displacement of any steamer on the lakes, and on her regular runs develops more power than any other lake vessel. At 80 revolutions and with 100 pounds of steam the Owego's engines, the largest on the lakes, developed 2,006 horse power. Her engines are 28, 42 1/2, and 72 by 54 inches stroke. Smaller steamers make 12 and 14 miles an hour with from 1,200 to 1,400 horse power and carry almost twice as much. This is only an example showing the great amount of power required to add a mile to the normal speed.—*Marine Review.*

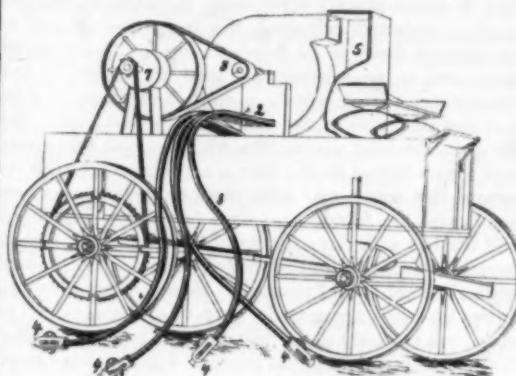
NEW BROAD STREET STATION AT PHILADELPHIA.

We show in this issue a perspective view, reproduced from the architect's drawing, of the new passenger station of the Pennsylvania railroad at Broad Street, Philadelphia. The drawing explains itself and little description is necessary. It will be observed that the existing station, which appears at the extreme right of the cut, will remain of the same height as at present. The most novel feature of the completed building will be the arcade, extending over a portion of the sidewalk throughout the entire front and a part of the sides. At the extreme left of this arcade is a platform extending out to the curb line. This platform is on the track level and affords a convenient means of transferring baggage from the station to wagons without lifting it. The currents of arriving and departing passengers are entirely separated, the main exit being on the Market Street side. The east front has a large number of entrances. The principal entrance for the offices in the upper stories will be at the main entrance, corner of Broad and Market, and at the corner of Fifteenth and Filbert. Definite plans for the upper floors have not yet been made, but it is estimated that there will be about 200 offices, so as to accommodate all the officers and clerks now housed at Fourth and Walnut Streets.

The train shed is 307 feet by 707 feet, and will be 140 feet high at the center. The main arches have a clear span of 294 feet and a clear height of 104 1/2 feet. The structure will require 3,000 tons of iron, and there will be about 1 1/4 acres of glass in the roof. The officers of the road, who have made careful comparisons, state that this train shed will be the largest in the world, larger even than those of the Midland, the London, Chatham & Dover, and others in London.—*Railroad Gazette.*

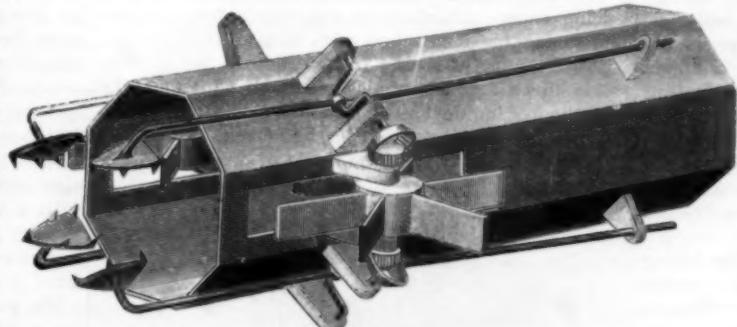
AN IMPROVED COTTON PICKER.

The cotton picking machine shown in the illustration is of simple and inexpensive construction, as com-



HYDE'S COTTON PICKER.

pared with many other devices which have been brought forward for facilitating the gathering of the



HYDE'S COTTON PICKER—MECHANISM OF THE PICKER.

cotton crop, and is designed in its operation to simulate the action of the hand as nearly as possible. The improvement has been patented by Mr. Thomas B. Hyde, of Taylor, Texas. The apparatus is mounted in a wagon to be drawn over the field, a fan case, 1, being connected with tubular conveyors, 2, having flexible extensions, 3, at the ends of which are the "pickers," 4, the mechanism of which is shown in one of the views. The power to operate the fan is preferably obtained by belting from one of the wheels of the vehicle to a spring motor, 7, the latter being connected by another belt with the fan shaft, 8, the cotton being drawn up through the flexible tubes, by the suction thus made, to a suitable receptacle, 5, whence it may

also be delivered into the wagon, 6. An electric or other motor may be employed, if desired, in which power may be stored to operate the fan while the wagon is at a standstill long enough to permit the picking of all the cotton within reach. It is designed that four or more of the pickers shall be connected with the tubular conveyors on each side, each operator holding in each hand a picker, which is held successively to the different heads of the cotton plants in reach. The picker is inclosed in a shell having a handle to be grasped by the operator, a sleeve in this shell having a slot in each side, in which work oppositely arranged fans. The shafts of these fans carry pinions, which operate cranks attached to reciprocating arms on the sides of the sleeve, the front ends of these arms being bent inwardly and terminating in claws or fingers. The small fan wheels in the pickers are rotated by the suction caused in the conveyors as the main fan is revolved, and a rapid reciprocating motion is thus communicated to the picker arms, the toothed jaws of which detach the cotton from the boll and throw it back, the wings of the small fan wheels aiding in taking the cotton from the picker jaws, and the suction carrying the picked cotton through the flexible tubes to the receiver. The inventor of this machine has lived in the cotton country all his life, and the improvement is the result of much experimenting. It is said that by the use of this apparatus one man can pick 1,000 pounds of seed cotton in a day of ten hours.

Varnish for Celluloid Negatives.

We are often asked for a formula for a varnish for negatives on celluloid films that will not attack the celluloid. Here is one that answers well in our hands: White lac, or pale orange lac, four ounces; methylated spirit, eight ounces. When dissolved, add liquor ammonie, six ounces, and boiling water half a pint, and afterward a drachm and a half of glycerine. This solution may be filtered, or it may be allowed to stand and settle and the clearer portion decanted. It will generally have a somewhat opalescent or turbid appearance, but that may be disregarded, as it will not affect the negative. The mode of using is this: After the negative has been fixed and washed, it is thoroughly drained. The varnish is then poured into a dish and the negative immersed and allowed to soak for a few minutes. It is then taken out and pinned by one corner to the edge of a shelf or other convenient article to dry. This varnish will also answer for negatives on glass, and it may be applied while the film is still moist; but, on the whole, for glass negatives a good spirit varnish is to be preferred.



NEW BROAD STREET STATION OF THE PENNSYLVANIA RAILROAD, PHILADELPHIA PA

Mistakes in a Boiler Room.

The *Locomotive* tells the following story, and the editor vouches for its accuracy:

A short time ago our attention was called to some most remarkable doings in a boiler room, which we propose to relate. The boiler was originally built to furnish power, and was good for about 75 pounds steam pressure; but it is now used only for heating purposes. Some of the steam and return valves to the large coils leaked about the stems, and the owner of the boiler, instead of sending for a steam fitter to repack them, called in a plumber. The plumber, being busy, sent his boy helper. The boy began work on some of the valves that were within sight of the boiler front, but being troubled by the steam that escaped, he shut off the steam valves, leaving the return valves open. The coils were large, and when the steam in them had condensed, water began to back up from the boiler, for there was no check valve on the returns. As the boy worked away he noticed that the water in the gauge glass was going down somewhat rapidly, and also that the steam pressure was rising. He did not know where the water was going to, nor did he know how to feed it more; but he thought that if he opened the furnace door, and so checked the fire, the evaporation and the rise of pressure would proceed much more slowly. Jumping down into the pit in front of the boiler, he opened what he thought, in the darkness, were the fire doors, but it appeared subsequently that he did open the ash-pit doors, this making matters worse instead of better. The fire brightened up and the pressure began to rise rapidly and the water level to go down. The boy was greatly troubled at this, and when the rubber diaphragm in the damper regulator burst from the increasing pressure, he "went all to pieces," as the saying is, and ran for his boss.

The boiler being originally intended for furnishing power, the safety valve could not be set to blow at less than about twenty pounds, while the damper regulator was designed to carry not more than six pounds or seven pounds, so that its diaphragm burst, naturally enough, before the blowing-off point of the safety valve was reached. The plumber came in haste and found the boy in the building overhead badly frightened, and the boiler room filled with steam, so that he could not make out precisely what had happened. He told the boy how to turn on the feed, however, and that well-meaning but badly "rattled" individual went to the back end of the setting, and, instead of opening the plug-cock in the feed pipe, he opened the plug-cock in the blow-off pipe, which only added to the noise and confusion. Meanwhile, the plumber hauled the fire out onto some pine boards that the regular attendant had laid in the damp pit. The boards took fire, and smoke was soon added to the escaping steam, to the intense horror of the occupants of the building, who by this time were on the other side of the street. When the fire had been hauled and the danger averted, the plumber soon learned the cause of the disturbance, and quiet was speedily restored by shutting off the damper regulator and the blow-off, and throwing a few buckets of water on the burning boards. It seems hardly possible that such a succession of mistakes could follow one after another in so orderly a manner, but we can testify, from personal observation, that they did. And we may add that not long afterward, when the boiler was out of use, a coal dealer put 100 tons or so of coal into the same boiler room, piling it up in such a manner that some of it ran down into the open man-hole, and the rest of it covered up the blow-off pipe and the rear door of the setting, which were both open, so that there was plenty of trouble digging them out before the boiler could be started again.

The Art of Thinking.

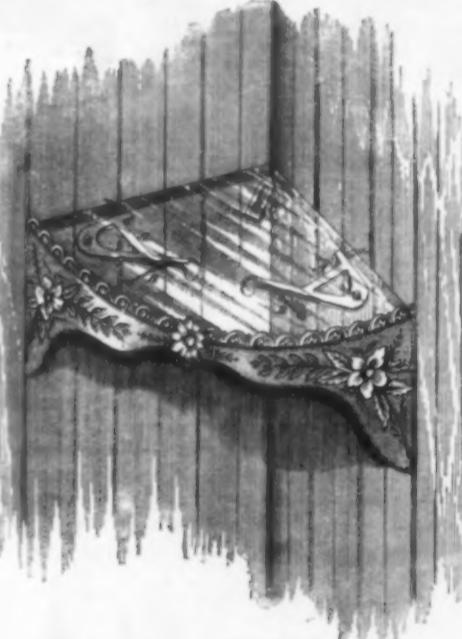
Did you ever notice how bunglingly some men think? There is as much or more difference in the way men use their mental faculties as there is in the way they use their tools. Just as one man will proceed deftly and systematically to the accomplishment of a piece of work with everything conveniently at hand, every motion intelligently directed to the furtherance of the main purpose, and an expedient ready for every irregularity or difficulty which presents itself, so the ready thinker proceeds at once in a right line to the pith of a subject, sifting out the extraneous matter, defining the main point, and bringing to bear upon it all his available information. On the other hand, a clumsy thinker will chase a question up one side and down the other, without getting anywhere or arriving at any relevant conclusion.

The mental like the manual faculties are susceptible and require cultivation. It is only by practice and continual use that the dexterity and skill of the expert machinist or other manipulator are acquired. No matter how naturally ingenious and handy a man may be, he will lack deftness when placed upon work to which he is entirely unaccustomed. In order to think with facility a man must be accustomed to thinking. It is one thing to let the mind roam about among the things one knows, and another to put it hard at work and keep it there, grinding at something you do not know, but want to. It is easy and enter-

taining to read an article which tells you something which you knew before and which you can indorse, but you learn nothing by reading it. It requires an effort to read an article which contains real information, however plainly expressed. It has to be studied, applied, digested, criticised, the suggestions raised by its perusal have to be followed out to their conclusions, and to conscientiously read an article of this character is a task which a man is inclined to shirk just as a lazy man might shirk a physical task. But compare the man who shirks with the man who reads, and you will find in the first a mental bungler, in the second the acute and able thinker, the man whose head saves his hands and who is valued, respected, and trusted with the conduct of work and the administration of affairs, and rewarded accordingly. Always read a little ahead of yourself. Read matter which requires an effort upon your part to understand. The effort will not only place you upon a higher intellectual plane, but the mental exercise will develop a habit of accurate thinking which will be of more value to you than volumes of average matter read only to be forgotten.—*Power.*

AN ADJUSTABLE CORNER SHELF.

The illustration represents a corner bracket shelf having simple attachments adapting it for a secure but removable connection with the walls of a room, without the use of tools. In the picture the shelf itself is shown as made of glass, through which may be seen the locking devices on its underside, whereby the shelf is secured in position in the corner of a room. The shelf, however, may be made of wood or other



LEGG'S CORNER BRACKET SHELF.

material, and in several pieces hinged together, so as to be collapsible, that it may be packed in small space. The locking mechanism for engagement with the side walls consists of pivoted D-shaped pieces, A A, on one member of each of which is a prong adapted to enter the wall, while the other member has a toothed surface to be engaged by a pawl, B, after the prong is forced into the wall, a thumb-piece forming the end of this member, and facilitating the forcing of the prong into the wall. Near the rear angle of the shelf a slotted pin, C, is secured in position to be conveniently projected or withdrawn, by means of a screw passing through the slot. The ornamental front edge of the shelf is removably secured in position by pins engaging slots in the upper border. It will be seen that this shelf can be quickly put up or taken down, being placed where it will afford the best position for displaying bric-a-brac, etc., thus also utilizing and ornamenting unused corners. The improvement has been patented by Mr. J. D. Legg, of Long Eddy, N. Y., of whom further particulars may be obtained, and the shelf is being manufactured by the Joy & Seliger Co., of Newark, N. J.

Tripes.

We have been challenged to pronounce an opinion on the dietetic virtues of tripe, an article of food which is largely consumed in certain parts of the country, especially during the winter months. Tripe consists of the soft muscular walls and mucous membrane of the stomach of ruminant animals, with a small proportion of delicate omental fat adhering, from which, however, all fibrous portions of the serous covering, or peritoneum, have been removed. From frequent experiments it has been proved that tripe stands high in the list of albuminous substances that are quickly acted on by the gastric juice and reduced to a state of solution, and has, therefore, acquired a reputation for digestibility. But plain boiled tripe in itself is a very insipid article of food, and in order to make it palatable the

art of the cook has to be invoked, which, while making it more "savory," causes it often, when so served, to be an offense to the stomach. The usual mode of serving tripe in this country is to boil it with milk and onions, and there can be little doubt that such a combination is not particularly digestible. Tripe is also sometimes fried in batter, but unless very carefully cooked it is apt to become leathery. If only plainly boiled in water it requires a considerable amount of condiments in the shape of salt, pepper, and mustard to make it acceptable to the palate. Therefore tripe, as usually cooked, though an excellent dish for strong stomachs, is, owing to the ingredients added to it, not always so suitable for persons of weak digestion as has been supposed.—*Lancet.*

Something About Paper Making.

A handsomely illustrated pamphlet on paper making has lately been issued by Messrs. Vernon Brothers & Co., the well known paper dealers of this city, from which we take the following:

For many centuries the stalks of the papyrus were used by the nations living about the Mediterranean in the manufacture of a material which served them for writing upon, and for wrapping purposes.

The papyrus is an aquatic plant having a soft cellular flower stem. This stem, of a triangular shape, grew from ten to twenty feet in height, and from its thin coats or pellicles the paper was made. These were separated by means of pins, or pointed mussel shells, and spread on a table sprinkled with water. On the first layer of these slips a second was placed crosswise, so as to form a sheet of convenient thickness, which, after being pressed and dried in the sun, was polished with a shell or other hard and smooth substance. Twenty sheets was the utmost that could be separated from one stalk, and those nearest the pith made the finest paper.

The principal manufacture of papyrus was carried on for a long time in Alexandria, and Europe and Asia were supplied therefrom during several centuries.

The art of making paper from fibrous matter reduced to a pulp in water appears to have been first discovered by the Chinese about eighteen hundred years ago. Chinese paper is made from the inner bark of the bamboo and mulberry trees, hempen rags, etc.

One description of the bark paper of China is as follows:

"The small branches of a tree resembling the mulberry (*Broussonetia*) are boiled in lye to loosen the bark; this is then macerated in water for several days, the outer part scraped off, and the inner part boiled and agitated in lye until it separates into fibers. It is then washed in a pan or sieve and worked by the hands into a pulp, which is afterward spread upon a table, and beaten fine with a mallet. The pulp is next placed in a tub containing an infusion of rice and a root called *oweni*, and thoroughly stirred to mix the materials. The sheets are formed by dipping a mould made of strips of bulrushes confined in a frame into the vat containing the pulp, and are, after moulding, laid one on another, with strips of reed between. A board and weights are laid on the pile to express the water, and they are then separated and dried in the sun."

The Saracens are supposed by their conquests in Bucaria, about the year 704, to have acquired the art of making cotton paper, and substituted it for the papyrus. In the eighth century the Saracens conquered Spain, and through that peninsula the art of making paper reached the rest of Europe.

The oldest manuscript written on cotton paper in England is in the Bodleian Collection of the British Museum, and bears date 1049. The most ancient manuscript on the same material in the Library of Paris is dated 1050. In 1085 A.D. the Christian successors of the Spanish Saracens made paper of rags instead of raw cotton, which is recognized by its yellowness and brittleness. A very early specimen of linen paper is found in a manuscript bearing date 1100 A.D.

In 1390 Ulman Strother established a paper mill at Nuremberg, in Bavaria, operated by two rollers, which set in motion eighteen stampers. This indicated the process of pulping the fiber by heating, which continued in use for nearly four centuries.

In 1690 the first paper mill was established in America by one William Rittenhouse, now spelled Rittenhouse, a native of Broich, in Holland, who emigrated to Germantown, Pa., being one of its first settlers. He, in company with William Bradford, established the mill at Roxborough, near Philadelphia, on a small stream called Paper Mill Run. The paper was made from linen rags, the product of flax which was raised in the vicinity and manufactured into wearing apparel. The second mill was erected in 1710, in that part of Germantown, Pa., called Crefeld, on a small stream that emptied into the Wissahickon Creek, near the manor of Springfield, by William De Wees, a brother-in-law of Nicholas Rittenhouse, son of the first paper maker.

In 1729 a paper mill was erected upon Chester Creek, Delaware County, Pa., by Thomas Wilcox. In 1870 paper was still made there by hand. The first paper mill of Massachusetts with legislative aid was erected

in 1730, at Milton. Daniel Henchman, an enterprising bookseller of Boston, was the probable owner. In these early stages of the paper development rags were scarce, the importation not being thought of, and people were exhorted in all ways to save their rags.

In 1790 it was announced in the *Boston News Letter* that "the bell cart will go through Boston before the end of next month to collect rags for the paper mills at Milton, when all people that will encourage the paper manufactory may dispose of them!" The following lines were appended to stir the public zeal:

"Rags are as beauties which concealed lie,
But when in paper how it charms the eye;
Pray save your rags, and beauties to discover,
For paper truly every one's a lover."

By the pen and press such knowledge is displayed
As wouldn't exist if paper were not made,
Wisdom of things mysterious, divine,
Illustrously doth on paper shine."

At the beginning of the revolution there were three small mills in Massachusetts and one ("out of repair") in Rhode Island. The amount of paper turned out, of course, fell far short of the demand, and the quality was poor. The people had not acquired the habit of saving rags, and, therefore, stock for the manufacturer of paper was obtained with great difficulty. Everything that could possibly be used for the purpose was ground up with the rags, and the result, both in color and texture, was sometimes peculiar, to say the least.

The Massachusetts House of Representatives, in view of the scarcity of paper, resolved that the Committees of Correspondence, Inspection, and Safety of the several towns be required to appoint some suitable person in each town to receive rags for the paper mills, and the inhabitants were desired to be very careful in saving even the smallest quantity of rags proper for paper making. During the war the paper makers were exempted from military duty.

In Pennsylvania the Council of Safety took measures to prevent the paper makers from joining the volunteers about to march to New Jersey, Congress having resolved that they should be detained, the demand for paper money having then come into existence.

Paper was so scarce when the American army entered Philadelphia, upon the evacuation of the British troops, that there was a want of paper fitted for the construction of cartridges. It was advertised for, and out a small quantity procured. An order was then issued demanding its instant production by all people in that city who had it. This produced but little more, very probably on account of its scarcity. A file of soldiers was then ordered to make search for it in every place where any was likely to be found. Among other places visited in July was a garret in the house in which Benjamin Franklin had previously had his printing office. Here were discovered about five hundred copies of a sermon which the Rev. Gilbert Tenant had written (printed by Franklin) upon "Defensive War," to arouse the colonists during the French troubles. They were all taken and used as cases for musket cartridges, and at once sent to the armory. Most of them were used at the battle of Monmouth.

The cylinder machine is believed to have been first used by Thomas Gilpen & Co., at Wilmington, Delaware. This was put in operation on the Brandywine, and was an American invention.

It was stated the machine would do the work of ten paper vats and deliver a sheet of greater width than any other made in America, and of any length required. A great impetus seems to have been given to paper manufacturing by the introduction of machinery, and changes in the mode of manufacture as well as in the materials used. Rope, hemp, tow, bagging, raw cotton, cotton waste, colored and filthy rags and other material, which had been previously used only in the manufacture of coarse papers, were gradually brought into use for the finest grades, by the introduction of chlorine and other means of cleansing and bleaching.

The modern improvements, such as drying cylinders, cutters, etc., were first introduced by David Ames, of Springfield, Mass. At the time of his death, machinery was in general use, there being but two vat mills of any note engaged in making paper by hand, and those were employed in producing peculiar sorts requiring great strength and firmness.

In 1856 it was estimated that the United States produced 200,000 tons of paper, against 66,000 tons in Great Britain and 70,000 tons in France. It was also estimated in the same year that if all the paper consumed in one year by the newspapers in the city of New York was put upon wagons containing two tons each, they would form a procession thirty miles in length, requiring six thousand wagons.

The industry up to the time of the rebellion had extended marvelously. The war coming on increased the consumption largely.

Paper which had actually been sold for nine cents a pound was gradually increased to twenty-two of the ordinary news quality, notwithstanding a vast quantity of old paper was procured from all quarters for stock.

During the war, 1861-1864, prices were so high that enormous profits were made, and all those owning mills became wealthy.

As a consequence, many people went into the manufacturing; mills were multiplied amazingly at every available water power; all sorts of enterprises for the manufacture were started—wood pulp, straw pulp, bamboo, side flags, etc.

In 1800 a reward of 8,000 francs was granted by the French government to Robert for the invention of what is known as the Fourdrinier machine. Donkin completed his first machine, acting on the ideas of Robert, in 1803; and in the succeeding year Henry and Sealy Fourdrinier (wealthy stationers of London) purchased the patents of Didot and Gamble. These gentlemen may be considered the great introducers of machine-made paper, and, like many other projectors, were rewarded by impoverishment.

It was Mr. Thomas Barrett, of St. Mary's, England, who obtained a patent for inserting the water mark and maker's name to a continuous paper, so as to resemble in every respect paper made by hand. This ingenious man also invented a mode of making iron rolls for finishing paper.

The methods of producing paper have been revolutionized within a few years by the invention of wood pulp. There are three kinds used—ground wood, soda-process wood, and sulphite-process wood; the two latter are not wood in either physical or chemical properties, but cellulose, similar to cotton in appearance and nature.

Ground wood was first invented in Germany in 1847, perfected by Voelter to a certain extent. It was produced by shredding the fibers from blocks of wood held against a sharp grindstone by hydraulic pressure, a stream of water pouring down upon these stones carrying away the pulp. Spruce, poplar, and other white woods are used. The process was introduced into this country by A. Pagenstecher, about 1861, when Senator Warner Miller and Wm. A. Russell commenced its use at their mills.

Very little could be used, as made by the German process. Messrs. Geo. E. Marshall, Wm. A. Russell, and Chas. W. Wheelwright in experimenting found that by using a coarse grinding stone and doubling the power, a pulp was produced that could be worked into news to the extent of seventy-five per cent. The cost of pulp has been reduced from 7 cents per pound to 1½ cents at the present time. This improved the quality of the paper made, besides cheapening the cost of production; and without wood pulp it would be impossible to supply the demand for paper at the present day. The introduction of ground wood has lowered the price of news paper from 15 cents to 3½ cents for such paper as is used by the *New York Evening Post*, and such paper as is used by the *New York Sun* to 8 cents, giving an almost opaque paper, soft for rapid printing. The production of ground wood is enormous in this country and in Canada, Germany, Norway, and Sweden. Nearly every stream in the forest regions has a pulp mill.

Soda-process wood makes the best papers—they cannot be distinguished from those made from fine cotton. Nearly all the best book papers contain a large proportion of this wood, as do most writing papers. The soda process was invented in France by M. Meliner, about 1865. White, resinous woods are used; spruce and poplar most extensively. The blocks of wood are cut into large chips, boiled in a strong solution of caustic soda under pressure, which leaves a fine, soft, fibrous cellulose. Small quantities of this pulp cannot be detected in paper except by the polarization of light in a microscope. It is now made in all the Eastern States. The manufacture of soda wood pulp was not a profitable one until the Yaryan system of evaporation was developed by Col. A. G. Paine, in 1886, by which the recovery of alkali was accomplished at a very low cost. Some of the most extensively used papers are made entirely of soda wood pulp, those suitable for weekly trade and religious newspapers selling from 5 to 6 cents per pound.

Sulphite wood pulp is made by the acid sulphite of lime process. Its manufacture was first attempted and invented by Tihlman, the celebrated chemist of Philadelphia, who made extensive experiments and then abandoned it. It was next made in Europe, by Franke, in Norway, about 1873. Eckman invented a process of bisulphite of magnesia, but this process is not used in this country. The experiments were taken up again by Mitterlich, Rittenur, and Koehler, in Germany, and wood pulp was extensively made by them. It was first introduced into this country by Chas. W. Wheelwright, of Providence, R. I.

It is sometimes said by those not posted that English papers are better; this is not so. American book, news, and writing papers are in the higher grades the best that are made. Our wise protective policy has stimulated invention and production until we have now the best paid operatives and we make the best quality. It takes the best quality of brains to make uniformly good paper.

We now export news paper to various parts of the world and at the prices ruling here, the foreigners paying the freight. Large quantities of paper are now exported to England, Ireland, Australia, Mexico, and the West Indies.

Scientific Research in Medicine.

Numerous plants which had once a most evil reputation, and were shunned on account of their virulent poisonous properties, have of recent years been made subservient to the wants of man. The umbu, a species of strophanthus which yielded the well known South African arrow poison, has been found of incalculable benefit in cardiac disease. Urari, another arrow poison, obtained from *Strychnos toxifera*, a native of the Orinoco and Amazonian forests, probably mixed with the juice of other species, is one of the most valuable of the drugs used in physiological experiment. The celebrated ordeal bean of Old Calabar, *Physostigma venenosum*, a plant so deadly as to be ordered to be destroyed by a thoughtless government, has yielded under careful research a powerful sedative to the spinal cord and valuable agent in ophthalmic cases. Another African ordeal poison was yielded by *Erythrophleum guineense*, the sassafras of the Gambia, and cassia of the Congo. The bark on infusion yields "red water," the material used in the ordeal. In medicine cassia is useful in the treatment of cardiac dropsy and hemorrhage. One of the most deadly plants of the West Indies, formerly a stock poison of the Obeahs, and probably still in use in Hayti, is *Urechites suberecta*. Now this plant is recognized as a cure for yellow fever. Jamaica dogwood (*Piscidia erythrina*) used by natives as a fish poison, appears in the United States Pharmacopeia as an anodyne and hypnotic. These are only a few of many instances in which plants formerly used destructively against human life have now become subservient to its preservation and resuscitation. Then again, to glance at the counter side of the poison question, consider the number of plants from which we may now obtain antidotes to both vegetable and animal poisons. A curbitaceous plant of the West Indies (*Fevillea cordifolia*) will expel the poison of the cacoons. The juice of *Oxalis corniculata* relieves the intoxication produced by datura seeds. Even Calabar bean is said to be an antidote to strychnine poisoning. The machoneel tree, more deadly than the famous upas, grows side by side with its antidote—white wood cedar, a species of tecoma. Not content with extracting and analyzing natural *simplicia*, we actually venture to compete with nature, and enter the lists against her as manufacturers. Indeed, chemists confidently look for the day when all alkaloids will be artificially synthesized, and anticipate the time when medical diagnosis will have only to tell us just what is the matter, and chemistry will straightway answer, "Here is the requisite cure manufactured to suit the case."—Prof. R. J. Harvey Gibson.

Removing Ornamental Trees.

In lifting and removing large ornamental trees, great care is requisite not to cut, bark, or otherwise injure the roots in course of the operation; and in order to guard against such a contingency, I have been in the habit of using digging forks for this purpose in preference to spades, by which means the risk of damage is lessened to a considerable extent. In planting the trees, should the soil be poor and exhausted, some rich friable loam should be brought and mixed with the soil. This will have a beneficial effect in promoting the growth of the trees. The roots should be well spread out in all directions from the base of the stem, and care should be taken to see that they do not cross or in any way overlap each other. Stake, tie, and fence the trees according to their requirements, and apply a good mulching to prevent a too sudden evaporation; and, if thought necessary, finish by erecting a screen cage of branches around the tree to shelter and break the force of the wind until such time as the roots take to the soil and get established. A very efficient shelter may be erected for this purpose by placing four upright posts in the ground at right angles, and at a reasonable distance from the tree; then, by nailing on say three or four horizontal rails, and warping in a few branches, a useful screen can be formed at small cost, and on exposed situations will be found highly beneficial to the trees.—*The Garden*.

Physiological Experiments with Great Magnets.

At the Edison Laboratory Dr. Fred. Peterson and A. E. Kennelly have sought to prove that no therapeutic effects are resultant from the application of magnetism to the human system. For the purpose of experiment the armature was taken from a dynamo, and in the cylinder formed by the inner ends of the set of powerful converging field magnets a dog was confined and kept for a period of five hours. The intensity of these magnets was from 1,000 to 2,000 c. g. s. lines to the square centimeter. At the end of the time mentioned the dog was set at liberty, and beyond his apparent joy at thus being set loose the operation did not seem to affect him in the least.

A boy was also confined for a short time in the same position and was also uninfluenced. Several other experiments of like nature were made. Dr. Peterson and Mr. Kennelly conclude from their experiments that the human organism is in nowise affected by the most powerful magnets known to modern science.

HERON HUNTING.

Heron hunting is a sport which has almost sunk into oblivion, but now seems likely to be brought into vogue again, for the Emperor William has declared his intention of using falcons in hunting the herons that are so numerous in the neighborhood of Konigs-Wusterhausen. This species of chase, which is not to be confounded with hawking, is conducted as follows: A number of ladies and gentlemen, who are to accompany the chase as spectators, assemble on a large heath or plain over which the herons pass daily, with a certain regularity, in going from their fishing grounds to the heronry. A few steps from them are the falconers, usually two or three, each one carrying on his gloved hand a hooded and fettered falcon. Near the falconers are servants who carry light wooden frames on which are reserve falcons, also hooded and fettered. On an elevation in the distance is a single rider who acts as a sentinel and whose duty it is to signal to the falconers the approach of a heron. He does this by alighting from his horse as soon as he discerns the bird coming from the fishing place or the woods, and turning his horse's head in toward the

swoop until the heron gives up all resistance and with outstretched legs and raised head lets itself fall perpendicularly. Sometimes one or both of the falcons cling to the heron, and then all fall together in a confused mass. At some distance from the ground the falcons release their hold on their victim so as to avoid the shock of the fall, but the next minute they are hanging on him again. During flight the heron does not use his sharp-pointed beak, but as soon as he feels firm ground under him he uses it in a vigorous defense. Formerly a rough-coated greyhound was taken on heron hunts which was trained to catch and hold the heron by the neck as soon as it fell. If the heron is not severely wounded in this flight, he is given his freedom after a ring bearing the date and the names of the huntsmen has been fastened on one leg.

In the middle ages falconry was a favorite sport in all the European courts, but it was given up in France during the reign of Louis XIV. and in Prussia in the time of Frederick the Great. In the smaller German courts, however, it was practiced until the end of the last century.

Falconry (called by the French *la haute volerie*)

was called to a large rat taking the berries off with his mouth and dropping them to other rats below. Presently another climbed the tree and helped to gather the berries. In a little time both came down each with a berry in its mouth, having a curious appearance. Mr. Reade saw the performance several times repeated. Then he placed a wire cage under the tree, and in three days caught nine of the intruders.

Kerite.

At certain intervals solutions of rubber in paraffine wax are brought out as insulators, and a substance of this kind has been called "kerite." Rubber dissolves slowly in paraffine wax and forms a compound combining the properties of paraffine wax and the original rubber. It will be found that very little rubber goes a long way in this compound. Some time ago one of our staff experimented on the vulcanization of this substance. Paraffine wax does not dissolve sulphur, so a little was dissolved in anthracene, which dissolves it easily and mixes with paraffine without precipitating the sulphur. The solution was thus vulcanized into a gray substance. This does not melt properly, but one



HERON HUNTING—ORIGINAL DRAWING BY LUDWIG BECKMANN.

heron. The falconers then move slowly from two sides in the direction indicated and allow the heron to pass quietly above and between them, then the hoods are removed from the falcons' heads, and as soon as they have descried the prey, their fetters are taken off and they are "thrown." The falcon seldom flies directly toward the heron, but generally moves rapidly at a moderate height above the ground until near its prey and then mounts. As soon as the heron notices that he is pursued, he tries, in case he is coming from fishing, with a full crop, to lighten himself by stretching out his neck and throwing out the fish that he has swallowed, and then as he knows by instinct or experience that the falcon will fall on him as soon as it succeeds in reaching a higher point, he uses all his strength to fly higher than his pursuer. Sometimes the heron succeeds in doing this, and then he vanishes in the clouds, but he is generally overtaken by the falcon, which then, quick as an arrow, rushes on the heron and tries to seize him by the neck or wing. The first attempt is often unsuccessful, because the heron skillfully avoids the falcon at the critical moment. This gives him an advantage, for the falcon is frequently carried far below him by the force of its movement, but now a second falcon comes to the assistance of the first one, and then follows swoop upon

should not be confused with the ordinary hawking (*la basse volerie*). For the latter, low-flying birds, such as hawks, are used, and also a dog to act as a retriever, the prey being grouse, hares, and water fowl. In England there are many "hawking clubs."

The terminology of falconry and hawking is extremely complicated, especially in regard to the names given to the birds, which depend not only on their species, but also on their age, the time of catching and training, and the nature of the game they hunt. The literature relating to the subject is very rich. James C. Harting's illustrated "Bibliotheca Accipitraria," which was published in London last year, brings the number of works on falconry up to 378. The first book published in Europe on the subject (1245) was the celebrated work of the Emperor Frederick II., "De Arte Vendandi cum Avibus." The beautiful work of Schlegel and Wouwerholt, "Traité de Faunonnerie," appeared in 1853, in Leyden and Dusseldorf. —*Illustrierte Zeitung.*

Gooseberry Mats.

Mr. G. Reade, in the *Zoologist*, says that the ripe gooseberries in his garden were disappearing very rapidly this year, and he supposed that the mischief was being done by blackbirds. However, his attention

of its most curious properties is its adherence to glass. The beaker in which the vulcanization was carried out fell, but the glass did not separate from the compound. The beaker was then battered into little pieces purposely, but they adhered strongly to the compound. As paper and waxed paper are now so much thought of as insulators, it is likely that paper saturated with kerite may become of considerable use. Its properties are, no doubt, very well known to those who make it; but, unfortunately, such matters are generally kept secret for commercial reasons.—*Industries.*

Interesting Gun Trials.

According to the Reading (Pa.) *Times*, some rather surprising results were lately obtained with a new multicharge gun, of Haskell's pattern, half-inch bore. The trial took place at the Kurtz House proving ground. A solid hammered wrought iron target, $7\frac{1}{2}$ inches thick, was penetrated entirely through, backed by a boiler plate $\frac{3}{8}$ of an inch thick, which was also penetrated through, making a penetration of $7\frac{1}{2}$ inches. The shot was made of Carpenter steel, and the charges of powder were 10 ounces.

This penetration is nearly sixteen times the diameter of the projectile, or more than four times greater than has ever been obtained by any other gun.

TALKING BETWEEN NEW YORK AND CHICAGO.

In the account of the opening of the telephone line between New York and Chicago as given in our last number, we mentioned the interesting fact that Prof. Bell was photographed by flashlight while talking with Mr. William H. Hubbard, at Chicago, a distance of nearly 1,000 miles. Our illustration, taken from the *Electrical Review*, is reproduced from the flashlight photograph and is interesting historically as showing the advances made in both sciences, telephony and photography. Directly back of Prof. Bell stands President John E. Hudson, of the American Telephone and Telegraph Company, and at his right is Mr. E. J. Hall, the Vice-President and General Manager.

It happened that at the time of the great Milwaukee fire on the 28th ult., the long distance lines were completed between Chicago and Milwaukee, which enabled the general superintendent, Mr. A. S. Hibbard, in his office at New York the next morning after the fire to give directions verbally by telephone in regard to the necessary repairs to the superintendent located in the suburbs of Milwaukee.

PROPOSED DESIGN FOR AN ATLANTIC PASSENGER STEAMER.

BY JAMES GRAHAM.

The question of transatlantic passenger traffic is one assuming greater importance from year to year with the rapidly increasing travel from America to Europe.

A large proportion of the seventy millions of people in this country and Canada would, doubtless, like to cross the ocean if they could do so with greater comfort and less expense.

The great steamship companies have attempted to meet the demand by putting on larger and faster steamers, but they have not reduced the rates; on the

contrary, the rates are higher, owing to increased cost of running such steamers.

The large steamers that are being built will probably mark the limit to profitable advance in size and speed with the present model of Atlantic passenger

Ten years ago \$750,000 was about the cost of the large ships, then the cost rapidly advanced with the rivalry in speed, till now they cost \$2,000,000, and the latest Cunarders will cost half a million more, while those of the White Star line will be at least \$3,000,000.

The passenger area of a 700 foot steamer is not much greater than that of one of 590 feet, and the speed will be only about two knots faster.

Our engraving illustrates a new design for an Atlantic passenger steamer in which greatly increased length is secured without proportional increase of draught and beam.

The proposition is to construct a system of nine hulls of special model connected in three trains of three hulls each, the center train being the principal part of the craft, and extending 235 feet forward and 200 feet abaft of the other two trains, the whole forming an outline similar to that of an ordinary ship. The total length would be 1,440 feet, breadth over three trains 142 feet, to outside of floats 180 feet.

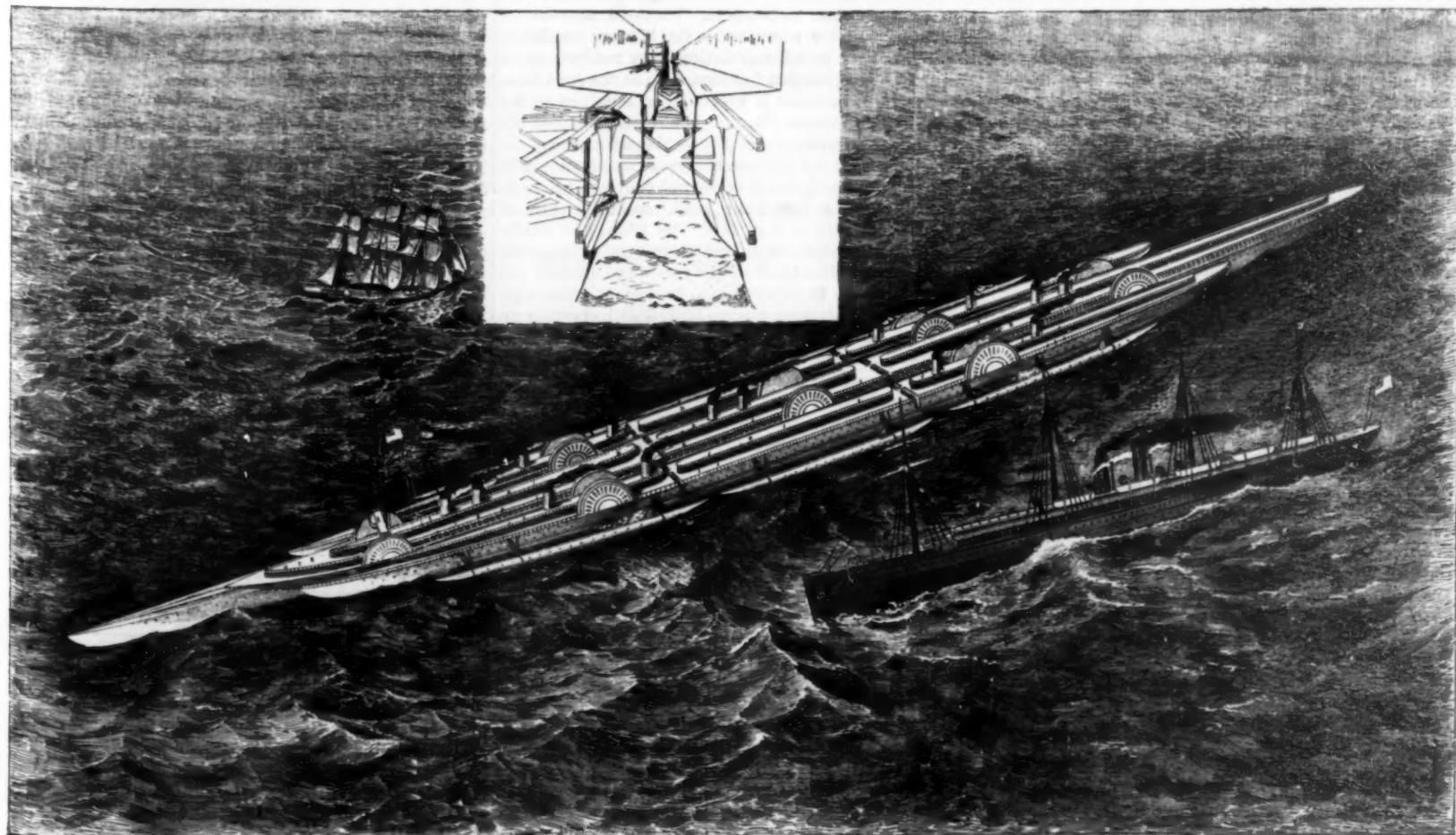
Midship draught of center train, 18 feet; midship beam at water line, 45 feet; midship beam at main deck, 60 feet; midship draught of outer trains, 12 feet; midship beam at water line, 27 feet; midship beam at main deck, 35 feet; displacement of center train, 15,000 tons; of outer trains, each, 5,250 tons; total displacement about 26,000 tons. The propelling power would consist of seven engines, three in center train of 10,000 horse power each; two in forward sections of outer trains, 4,000 each; two in stern sections, 6,000

each. A total of 50,000 horse power, driving seven pairs of paddle wheels of 52 and 56 feet diameter, 6 and 8 feet wide, and having a dip of 8 feet.

This steamer would carry no cargo, and, owing to the system of construction, would require no ballast, so that the entire tonnage capacity would be



PROFESSOR BELL TALKING BY TELEPHONE FROM NEW YORK TO CHICAGO.



GRAHAM'S DESIGN FOR AN ATLANTIC PASSENGER STEAMER.

available for engines and fuel. She would be intended for only first and second class passengers, and have accommodation for 2,000 of each.

The sections would be held in position by a system of flexible connectors, consisting of massive steel transverse girders, 10 feet deep, having rocker ends bearing against uprights connecting the upper and lower decks. The ends of the rockers would bear against a series of heavy half elliptic springs, having a flexible strength of 50 and 75 tons each. These springs would extend along the upper and lower decks, and would stiffen and check the motion of the rockers. A strong wire cable would be fastened in the end of the rocker, then pass over a roller secured in the upper deck, thence down under a similar roller in lower deck and connect with the other end of the rocker. A second cable would be fastened to the inner side of the spring, pass around the roller and connect with the rocker, so as to act reciprocatingly. The beams connecting with the girders would be braced transversely and run diagonally throughout the sections. The longitudinal connectors of the sections would be a single massive coupler in center of each section, placed on a level with the center of the lateral connectors and 12 feet above the water line. The longitudinal frames of the sections would converge at the point of connection. The coupler and the frames diverging from it would, of course, have to be of immense strength and capable of sustaining a strain of one or two thousand tons. The space between the ends of the connecting hulls would gradually widen from the connector down to the keel plate, where it would be about 5 or 6 feet on a level keel, which would admit of a depression of the stem of the center train of 120 feet. This space would be occupied by a metal and rubber water-tight chamber that would expand and compress with the vertical motion of the ends of the hulls, and prevent the water from filling in between the ends.

There would be hinged to the bottom of the forward section sliding plates that would extend under the bottom of the adjoining section, thus forming an even and continuous bottom from stem to stern of each train.

It is estimated that 5,000 tons of steel would be used in the construction of the connectors and in the strengthening of the parts of the sections where the greatest strain would occur. The hulls would be entirely of steel.

It is thought that a steamer of this design could be built sufficiently strong to withstand a much greater strain than she would ever encounter in the waves of the Atlantic.

The design would admit of the different sections conforming to the angle or elevation of any size of waves she would meet without straining.

One of the important advantages that a steamer of the proposed plan and proportions would have is the immunity from the horrors of seasickness that the passengers would enjoy, as there would be scarcely any rolling motion, and the vertical motion would be confined chiefly to the forward ends of the forward sections and would diminish toward the stern, where it would hardly be perceptible even in the roughest sea, as the forward sections would break the force and form of the waves they would pass over.

The steel floats on the outside might retard the speed a knot or two, but they are not a necessary part of the plan and may be detached. They furnish berths for four or five hundred of the crew, also help to steady the outer trains, and would be useful for collision fenders.

It is proposed to use paddle wheels for the propelling medium. Of course, 3, 4 or 5 screws could be used at the stern, but would not be so suitable for the high speed as the paddles, which, working in protected water, and having a diameter of 56 feet, with engines to drive them at 35 revolutions, should make about 35 knots.

To many no doubt it may seem impossible to control the motion of such heavy structures in a seaway. As a matter of fact there is only one motion in a seaway that is not preventable, and that is the vertical motion, which it is not necessary to control.

The system of connection (as shown in the smaller view) allows playroom for that to a much greater extent than is necessary. The tendency, however, in a steamer of this design would be to lessen it. It is the lateral motion that could be easily diminished or prevented.

The proposed steamer would have accommodation for 4,000 passengers, giving a greater number of cubic feet for each passenger than the present steamers, and, as it would carry no freight, would remain a shorter time in port. So that at the speed that would be attained, she would average about one trip a week, or forty during a season of nine months. Carrying 100,000 passengers at present rates for corresponding class of accommodation, 80,000 first class would pay \$6,400,000; 80,000 second class, \$8,200,000; total, \$9,600,000; which ought to pay a very handsome dividend after paying operating expenses of one steamer.

It will be seen from the above figures that such a steamer as has been described could earn immense profits at one-half the present rates.

A \$5,000,000 hotel with accommodation for 1,000 guests at \$5 per day would pay well. There is no reason why a steamship (costing \$8,000,000 with room for 4,000) should not pay better at the same rates.

There are several reasons why cargo and passengers should be carried in separate vessels, and among them is the fact that it does not pay to carry cargo in a high priced passenger boat. A special cargo steamer (like a "whaleback," for example) can be built at a cost of \$300,000 that will carry more cargo than the *Majestic*, that cost \$2,000,000. But these steamers do not carry cargo for the money there is in it, but because they must have several thousand tons of cargo or ballast in their holds to give them the necessary stability and draught for effective working of screw. As the new design would require no ballast, she would run much lighter.

Natural History Notes.

Oysters and Mussels as Water Filters.—It has been observed that sea water, which always holds solid particles in suspension, becomes clear with surprising rapidity when an oyster or a mussel is placed in a vessel that contains it. These animals, in fact, as soon as they are immersed in their natural element, establish a rapid current of water between their separated valves. Of the particles that such current carries along, some are agglutinated into large lumps by a mucous secretion of the mantel and are then immediately rejected, while others traverse the digestive tube to be afterward expelled in the form of solid excrement. It results that after the lapse of a very short time, the mollusk has filtered the surrounding water, but the amount of filtered water is not the same with all oysters and mussels. The researches of Mr. H. Viallanes shows in fact, that mussels, in the same period of time, filter three times as much as the French oyster, and that the Portuguese oyster filters five and a half times as much.

From the standpoint of oyster culture, these results explain the cause of that dying off of oysters that culturists have been complaining of for some years, and indicate the remedy for it, that is, the suppression of the mussels and the proscription of Portuguese oysters from the parks in which the French oysters develop.

Mr. Viallanes' researches permit also of comprehending the importance of the role that these mollusks have played and are still playing in the economy of the seas and the building up of the continents. These animals, which endure changes of saltiness better than others, constitute colonies that are often immense and elevated as barriers at the confines of marine and fluvial waters. They are powerful filters charged with freeing the latter of the solid materials that they are carrying to the ocean.

Self-Mutilation in Orthoptera.—It has often been observed that many animals, when kept in captivity, develop certain unnatural traits. One of these is a tendency to self-mutilation—an instinct on the part of the animal which impels it to devour the extremities of its own body.

Dr. Franz Werner, of Vienna, Austria, has recently published some interesting observations in this direction on European orthoptera. From a number of species kept under observation Dr. Werner concludes that a tendency to self-mutilation does not prevail in the truly phytophagous families, such as the Acrididae and Gryllidae, but that it seems to be confined to the raptorial species and that it is most strongly developed in certain predaceous Locustidae with poorly developed wings. In all observations ample nourishment was provided, but this did not prevent the specimens from eating first their tarsi, especially those of the anterior pairs of legs, then the tibiae, and finally the females commenced to eat their own ovipositors. Among the species observed the rare *Saga serrata* excelled all others in its avidity to devour its entire legs, while *Mantis religiosa* was contented with chewing up its tarsal joints. Of *Barbitistes serricauda* Dr. Werner was not able to collect perfect examples, for as soon as a captured specimen is held between the fingers it bites off its own front legs with great rapidity. In most instances the chewing is deliberate and evidently without sensation of pain.—*Insect Life*.

The Giant Birds of New Zealand.—The discovery of the *Dinornis* by the illustrious zoologist Richard Owen is famous as one of the most notable feats in the history of science. From a single imperfect bone—a femur broken at both ends—he deduced the fact that an enormous bird of the struthious order, but far exceeding the ostrich in size, formerly inhabited New Zealand. This discovery, published in 1839, aroused much interest and led to further inquiry. Four years later, Mr. Owen was able to show, from a comparison of many fragments of skeletons that had reached him, that there had been at least six species of these gigantic birds. With additional materials, he, in 1850, had increased the number of species to eleven, classed in three genera, and varying in size from a kind no larger than the great bustard (or about five feet high) to one—the *Dinornis giganteus*—at least ten feet in height. Still later researches have shown that even this stature was in some instances surpassed, and that birds must

have existed in New Zealand whose height attained fourteen feet, or twice that of the largest ostrich.

The Succession of Teeth in the Mammalia.—It is a familiar fact that, whereas nearly all the lower vertebrates—fishes, batrachians, and reptiles—have an almost unlimited power of reproducing their teeth as occasion requires, the higher vertebrates, or mammals, are never provided with more than one change of teeth during their lifetime. It has also been for a long time well ascertained, that the lower mammals (Marsupialia) as a rule exhibit even less change of teeth than the higher (or placental) mammals. There has thus been great difficulty hitherto in explaining the manner in which the mammalian type of dentition became evolved from the primitive constantly reproduced type such as we observe, for instance, in the crocodiles. Numerous theories have been proposed to account for the apparent anomaly that the lower mammals exhibit less tooth change than the higher mammals, while, contrary to the teaching of the great pioneers in comparative anatomy, such as Cuvier and Owen, the majority of the modern school has long held the belief that mammals originally possessed but one set of teeth and gradually acquired the power of reproducing part of this set once in a lifetime.

The remarkable investigations of Dr. Willy Kukenthal have now afforded a definite solution of the problem. It appears from an examination of some embryos of opossums that the replacing set of teeth is actually present in the jaw, although only one of these teeth ever completely develops and becomes functional. It is also proved from a study of the embryos of certain armadillos and toothed whales in which no tooth replacement has been observed, that the replacing set is actually formed though absorbed without use in the adult. In short, we may definitely conclude that mammals originally inherited two sets of teeth from their cold-blooded ancestry, that in some groups, such as the toothed whales, some armadillos, and marsupials, the second set of teeth is almost or quite aborted, while in the majority of the higher mammals this set is functional and partly replaces the first set. As a matter of fact, the two series of teeth in the jaw of the embryo always originate by the division of a single series of germs, and in this respect the mammalian dentition presents some difference from that of the reptiles and batrachians. There are, moreover, other points still awaiting elucidation, as remarked in a critical article by Mr. Oldfield Thomas in the *Annals and Magazine of Natural History*.

Paleontology as usual may be expected sooner or later to assist in the solution of the remaining difficulties, and it is interesting to notice in the May number of the *American Journal of Science* that Professor Marsh has already a small contribution to the subject. In describing the primitive Eocene mammals, *Hyracops* and *Meniscotherium*, the professor remarks that the replaceable first set of teeth remains in use long after the appearance of the three permanent molars, thus suggesting that the latter are actually a retarded portion of this first set, and not part of the second series.

Lender's Paint.

The paint it is stated preserves metals from rust and is unaffected either by heat or cold. When applied to sheet iron it was found that the coating was unaffected by warm water or steam, and also to be unaffected by the action of acid and alkaline liquids, ammonia gas, hydrochloric acid gas, and sulphureted hydrogen gas. The principal ingredient in this paint is a silicate of iron which is found in the neighborhood of natural deposits of iron ores, and also occurs in veins, in deposits of granite, which have become decomposed by contact with the air. This deposit, which is employed in the form of a finely ground powder, is found to have the following composition :

Silicic acid.....	54
Phosphoric acid.....	05
Oxide of iron.....	8865
Alumina.....	05
Lime.....	175
Magnesia.....	125
Undetermined.....	23
	100.00

The silicate of iron in a very finely divided state is mixed with oxidized linseed oil, and varnish, to form a paste. When required in the form of paint, it is thinned down with good linseed oil, to which, if deemed desirable, a drier, such as litharge, is added, at the same time mineral colors to produce the required shade are likewise added.

Artificial India Rubber.

Dr. W. A. Tilden discovered some months ago that isoprene, which can be prepared from turpentine, under certain circumstances changes into what appears to be genuine India rubber. Bouchardat had also found that the same change could be brought about by heat. The material so produced resembles pure Para rubber in every way, and, whether it is genuine rubber or not, it may be equally good for all practical purposes. It is said to be capable of vulcanization.

WHY ARE STEREOGRAPHIC PRINTS TRANSPOSED?

Mr. Emil Kurtz asks this question of the SCIENTIFIC AMERICAN. This problem, although very simple, is somewhat puzzling. The stereoscopic prints are transposed to bring them into the position the object occupies when seen with the eyes. The two pictures numbered 1 and 2 represent the view as seen with the two eyes, the one marked "L" showing the view as it appears to the left eye, and the one marked "R" showing the view as it appears to the right eye. Each tube of the stereoscopic camera inverts its own view; therefore, when these pictures are turned a half revolution in their own planes, as shown in the second engraving, they represent the image formed in the camera, and consequently the negative as seen from the glass side, also the print from the negative.

By placing this double picture right side up, it will be seen that the images have been transposed in the camera in being inverted, and, as the letters L and R now adjoin each other, the left hand view appears in front of the right eye, while the right hand view appears in front of the left eye, as shown in Fig. 2. It is, therefore, obvious that to place these two pictures in position to correctly represent the views as seen by the eyes, they must be cut apart and transposed, when they will appear as in the first engraving.

The Heating of Cars by Steam.

A paper on this subject was read lately at the meeting of the Western Railway Club, by Mr. A. M. Waitt, assistant master car builder of the Lake Shore and Michigan Southern. The author believes that for some years to come steam is destined to be the working medium for car heating.

On the railroad with which the writer is connected we have had in use in coaches both the direct and indirect systems of heating, and with the indirect have tried four different kinds. We have had weekly, and sometimes daily, complaints of freezing traps, lack of circulation, cold cars, burst pipes, etc.; while from the direct system generally only one complaint has been heard, that of occasionally too much heat in mild weather. The result of the above experience, after three or four years' repetition, has been to cause the adoption by the Lake Shore and Michigan Southern R.R. of the direct system for all coaches, baggage and mail cars.

On sleepers the experiment has been tried with both systems of heating, resulting in the almost immediate abandonment of the direct system; for, when the berths were made up for the night and circulation of air was arrested behind the curtains, the heat became too oppressive for sleeping; and the porters were too apt to neglect the regulation of the heat, if, indeed, it were possible to properly regulate it. This result, of course, left the indirect system alone in the field for this class of cars. As there were many indirect systems proposed and used, it became a study to see which was the best, and to remedy, as far as possible, all existing defects.

It must be said of the writer's experience with indirect steam in sleepers on the rear end of from twelve to fourteen car trains, that in zero weather the complaints of cold cars, with temperature not above 60 deg., were very numerous, and this, with a pressure from the locomotive of 80 lb. It has also been found in such cars in zero weather that with cars cool when leaving a division terminal, and from 2 to 10 lb. of steam on the gauge, it would take from one to three hours before a temperature of 70 deg. was reached, and in many cases but little rise in temperature was obtained even in that time.

Taking up separately the different parts of steam heating apparatus, Mr. Waitt said that for the train pipe the general practice was to use 1 1/4 in. pipe well covered with asbestos lagging. He saw no advantages in carrying the train pipe overhead as practiced on a few roads. For connections a flexible wire-bound rub-

ber connection is cheaper and freer from leakage than any flexible metallic connection. A well made rubber hose, five-ply, wire-bound, made of not pure rubber, will stand at least one season's service without failure, and such hose is now made and guaranteed for such a time. It can also be said truthfully that there are in the market steam couplers, free from leaking, simple in manipulation, and highly satisfactory, that have now successfully stood the test for years.

shown that there has been a lack of the requisite radiating surface, and it is being gradually increased. The prevailing practice has been to use 1 1/4 in. pipe, and the same amount of it as with the simple Baker heater. In the writer's opinion much better results would be obtained in long cars by using not less than 1 1/2 in. pipe, thereby allowing freer circulation and increasing considerably the radiating surface.

The radiating pipes on each side of the car in the direct system should, for proper regulation of heat and adjustment, have a separate steam controlling valve and a drip valve, also a separate pressure gauge.

Steam Admission Valves.—In this feature of steam heating lies much of the secret of successful results in the direct system of car heating. Most cars at present are equipped with an ordinary cheap globe valve to control the admission of steam to the radiating pipes. With such valves in good order, if the valve is just started from its seat by a small fraction of a turn of the spindle, there is an opening made for the steam admission as large, if not larger, than the supply opening

from the locomotive boiler. This admission of steam is enough to keep the car well heated in freezing weather, after it has once been warmed up. If the weather is mild, and only enough heat wanted to take the chill off the air, it is impossible to graduate the valve sufficiently fine, but an approximate result must be obtained by alternate turning on and shutting off the steam, which, of course, results in great dissatisfaction.

Another difficulty with the common globe valve for an admission valve arises from the fact that it can be kept in order but a short time. After a few months' use they become so warped that few of them can be closed absolutely tight, and many times it becomes impossible to cool the cars off, except by shutting steam out of the car at the three-way valve. To overcome these difficulties, and to put it within the power of a reasonably intelligent trainman to regulate the amount of admission of steam to the amount passing through an aperture of 1-100 in. in diameter if desired, a committee was some months ago appointed by the heads of the mechanical departments of some of the Vanderbilt lines, to prepare specifications for a suitable valve. The result

inside the car the method of controlling the steam by a single three-way valve near the middle of the car is preferable to two single valves on each side of the branch pipe or two cocks in the train pipe at each end of the car under the platform. The three-way valve is simpler to understand and manipulate, is less work to apply, and is less liable to collect condensation and freeze. The cocks under the platform are objectionable, because the cocks can only be opened or closed when the car is standing still. The three-way valve should have the water from the drip pass in contact

with it to prevent the drip from freezing. We quote further as follows:

When the use of direct steam for car heating was first adopted, there was a fear of insufficient heating, and a mistake was made by the use of altogether too much radiating pipe. One of the first plans consisted of two lengths of 2 in. pipe on each side of the car, and in addition a spur of 2 in. pipe from 12 to 30 in. long under each seat. This resulted in putting steam heating into bad repute by making cars perfect sweat boxes, and making it very uncomfortable to sit on the

has been that two reputable companies are now prepared to furnish at a reasonable figure a valve having

all parts subject to wear renewable at small cost, leaving the shell of the valve intact; the valve is capable

of an adjustment such that one full revolution of the

spindle will give an area of opening of only about 1-100

in., the valve being capable of opening to full area of a

1 in. pipe. The valves are so constructed as to be

especially free from cutting out by wire drawing of

steam. With a durable valve of this kind it becomes

possible for a trainman to be able to readily regulate

the admission of steam to so

small an amount that it will not even heat the entire length of pipe in the car, and, with properly

instructed trainmen, good results can be obtained.

Traps.—If the inspectors and

trainmen on our roads are care-

fully questioned, it will be found

that traps are a source of con-

stant trouble, sometimes from

freezing up or choking with

water, and sometimes from al-

lowing too much steam to waste.

Of all the traps examined by

the writer, after they have been in

practical operation for any great

length of time, none have been

found but what need constant

readjustment to suit any mate-

rial changes of outside temper-

ature. It often happens that on starting on a long run

a trap may be all right for the present temperature,

but after a 400 or 500 mile run the thermometer stands

20 or 30 deg. lower; under these circumstances, many

traps become choked with water and frozen, causing

delays for thawing out and readjusting.

In view of these facts, many companies have aban-

doned the use of traps, and have substituted a much

more satisfactory method of caring for the condensa-

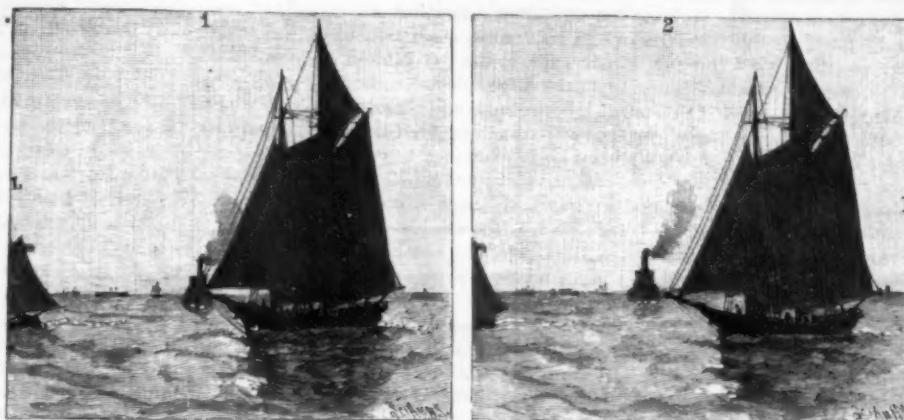


Fig. 1.—THE VIEW AS SEEN BY THE EYES.

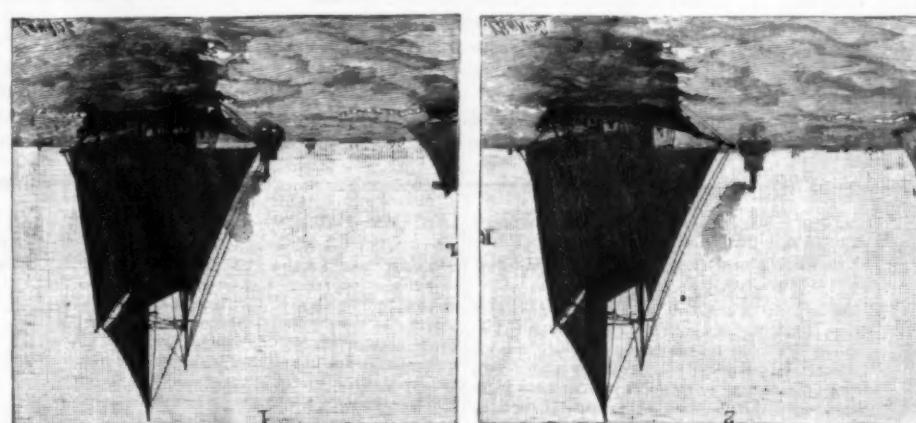


Fig. 2.—THE INVERTED IMAGES AS THEY APPEAR IN THE CAMERA AND NEGATIVE.

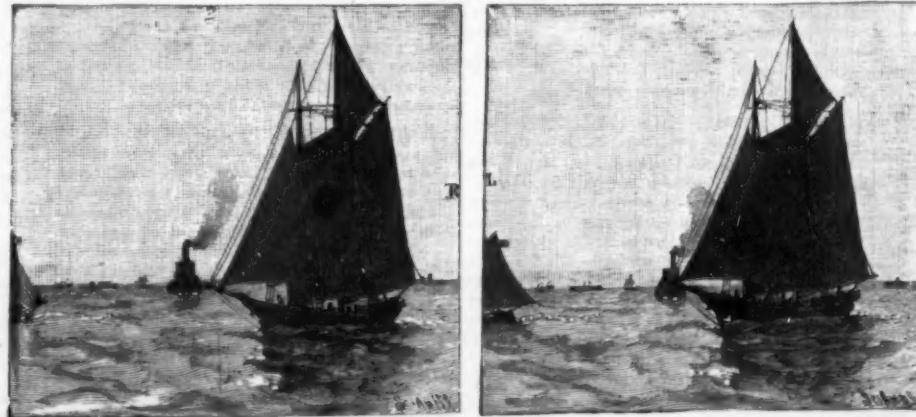


Fig. 3.—TRANSPOSED PRINTS.

cushions with a hot steam pipe directly under the entire length of each one. Gradually the use of spurs and return bends has been curtailed, until now the most approved arrangement consists of two lines of 2 in. pipe on each side of the car, without any spurs or radiators under the seat. In some cases it has been deemed best to use 1 1/4 in. pipe, and in addition a short 10 in. spur under alternate seats.

With the indirect system of heating, experience has

tion, namely, the use of a globe valve at the end of the radiating pipes on each side of the cars. In some cases it has been deemed wise to file a small groove in the valve seat, so that it can never be entirely closed. Such a groove is intended to be large enough to take care of all condensation in mild weather, and in cold weather the trainmen are expected to adjust the opening of the drip valve to suit the amount of condensation. By others it has been thought best to leave the drip valve intact, and to allow trainmen to regulate it for all conditions. This arrangement permits of allowing the condensation in mild weather to partially fill the radiating pipes, and the heat can be then controlled by the amount of condensation allowed to pass off. It can be readily seen that by this arrangement, if half the pipes were filled with water, the steam would only reach and heat the other half of the pipes.

With the present state of invention in relation to traps, I think the plain drip valves have decided advantages. In this connection I would recommend that, where possible, the steam admission and drip pipes should be kept in contact, and covered in the same jacket, and the outlet of the drip be in contact with the three-way valve, or pass through it as is arranged for in one style of three-way valve now on the market.

It may be of interest to know that since last spring a committee representing several of the Vanderbilt roads have had in hand an investigation of the matter of steam heating for cars, and a summary of the results of their work is contained in the following recommendations for adoption:

1. That the "direct" system of steam heating be used for heating coaches.

2. That the "indirect" system of steam heating be used in sleeping cars.

3. That in the "indirect" system, salt water or a non-freezing mixture be used in the circulating pipes.

4. That a three-way valve be uniformly used for controlling the steam in the main train pipe, the parts located inside the car to be uniform, the valve to take a solid (male) wrench, and the marking on the floor plate to be uniform, and to indicate the direction of the main train pipe and the branch supply pipe, and to be similar in size and style to the Martin floor plates, now in general use on the roads represented.

5. That we approve and adopt for general use the style of steam controlling valves as designed and made for our committee by Fairbanks & Co., of Boston,

and by the Safety Car Heating and Lighting Co., of New York.

6. That the use of traps for taking care of the drip be dispensed with.

7. That we use a globe valve for the drip valve, with a small slot filed in the seat of the valve, so it can never be entirely shut off.

8. That two lengths of 2 in. pipe on each side of the car with no spurs under the seats are sufficient for satisfactory heating.

9. That for "indirect" heating, all pipes and connections, except train pipe, shall be maintained inside the car. That the system be limited to one steam valve and one drip valve, placed uniformly in all cars.

10. That at all terminal and junction points, where passenger trains are made up, or cars are likely to be set off, facilities be provided for heating cars by steam, when not in trains. This we consider very essential to the successful heating of cars by steam.

Sea Sickness.

Most of those who have experienced the miseries of sea sickness, however they might differ in minor details of statement, would agree in ascribing this most dispiriting malady to one main cause—the motion of the ship. In so far the whole medical faculty would concur in their decision. This, then, is the central fact which confers upon the disorder its unique position. It is really not a pathological, but a physiological disturbance. It has no natural connection with dyspepsia. The robust and healthy, by a strange contradiction, suffer from it for the time hardly less than the weak and ill. Its variations of intensity are felt to be counterparts of mere bodily oscillation. Some find relief from it in change of posture, others in active occupation, all more or less when their storm-tossed vessel sails under the lee of land. Custom and use commonly secure immunity. These are circumstances which one and all point to mechanical causation as the source of the discomfort. It is the unaccustomed rise and fall, the jerk and relaxation of loosely attached abdominal viscera, mainly, perhaps, but not alone, of the stomach, acting upon the central nervous connections, which must bear the brunt of accusation. It follows that successful treatment cannot be guaranteed by any one method or panacea. Recumbency, pure deck air, moderately firm bandaging of the body, are all useful. Drugs have their place and their par-

tial utility; but, as we have already suggested, there is no remedy equal to a lee shore. Nothing can be much more depressing than sea sickness, and for this reason we should strongly advise all weak persons not to encounter if possible the risk of its occurrence. It is astonishing how soon and how completely those who are favored with a fair measure of constitutional elasticity recover from its depression. In their case the benefits of a sea trip may thus, with compensations of air, diet and appetite, be even enhanced by a few hours of mechanical nausea. It is, in truth, for such persons only that tours of this kind are advisable.—*Lancet*.

The Fastest Steam Launch.

The steam launch Yankee Doodle, probably the fastest boat of its class in the world, was unfortunately destroyed by fire, at Philadelphia, in September last. The boat was originally called the Buzz, built by Mosher, of Amesbury, Mass., but as her speed did not prove satisfactory her original boiler and wheel were removed and new ones substituted by her new owners, Messrs. McBride Brothers, of Philadelphia, Pa. The new boiler was quite remarkable. It had 410 one inch steel tubes, tested to 1,900 pounds to the square inch hydrostatic pressure; 360 feet tubular heating surface; weight, 2,000 pounds; grate surface, 8 feet; steam dome, a peculiar feature, 2 by 4 feet; usual boiler pressure, 150 pounds.

Screw, 34 inches, 5 feet 10 inch pitch; two blades; 550 revolutions per minute.

Engine, 160 horse power; two 8 by 8 inch cylinders. The hull was 50 feet long, 6½ feet beam; displacement, 4 tons; draught, 15 inches.

Her speediest record was made on the fourth of July last, when, according to the report of the official timers, Messrs. G. S. Carrigan, Dr. G. F. Root, and H. E. McPerson, she ran a mile on the Schuylkill River, on the National Course, in 2 minutes 1½ seconds—almost thirty miles an hour. The timers were not on the boat, and their record is believed to be reliable. We understand the Messrs. McBride intend, during the coming year, to build another boat equal or superior in speed.

CREOSOTED wood has been found to have such excellent lasting qualities that its economical properties have suggested its use for permanent haulage, roads, shaftways, etc., in collieries.

RECENTLY PATENTED INVENTIONS.

Engineering.

HYDRAULIC PROPELLER.—John T. Carsairs, Wellington, Canada. Two cylinders containing pistons are, according to this invention, operated simultaneously to alternately draw in and discharge water from either the stern or bow of a vessel, thus propelling it forward or backward as desired. A set of pipes also leads from the gate boxes connected with the cylinders to each side of the vessel, whereby the vessel may be steered by manipulating the gates in the boxes.

Mechanical.

LATHER DOG.—Richmond Parsons, Philadelphia, Pa. This dog is made in two parts, the body part being of U-shape, with teeth on its inner faces, and the bridge piece being adapted to be passed laterally into and out of the body. It can be readily adjusted to different sized work, and applied without removing the center of the work from the lathe, a clamping screw firmly holding the work after adjustment.

MACHINE FOR NAPPING CLOTH.—George W. Burr and Michael Malony, Webster, Mass. This machine is especially designed for use with the ordinary shearing machine to raise the nap on woolen or worsted goods, and consists of an attachment having oppositely rotating napping cylinders, with needles to raise the nap both ways at the same time, in connection with a tension device to regulate the pressure of the cloth upon the cylinders. The invention also covers a novel construction of the cylinder needles.

SCREW DRIVER.—William E. Daily, Morristown, Tenn. This invention provides a tool of which the bit may be revolved, and the screw forced to place or withdrawn, by means of a crank handle and gear. The construction is such that the bit may be held to turn only with the shank of the screw driver, of which it constitutes a fixture, while one of the bits may be used with large screws and its other end with smaller ones.

COUPLING.—Irvin P. Doolittle, Redlands, Cal. A means for speedily and firmly connecting sections of pipe, hose, or solid rods, at their ends, and so they may be detached as desired, is provided by this invention. A spiral cam-locking lever is pivoted in a slot on a female coupling section, and has an adjustable interlocking connection, with a channel shoulder on a male coupling section. By means of a joint washer an air tight or water-tight joint is made between the joined coupling sections.

Miscellaneous.

GUN CLEANER.—Charles W. Wunderlich, Washington, Mo. This device has a stock portion with internally threaded socket, forwardly extending spring arms being connected to the peripheral face of the stock, their forward ends contracted and bent to form radial scraper fingers, while a conical expander, having a threaded shank, operates in the threaded socket of the stock. In use the cleaner is attached to the

ramrod of a gun, in the chamber of which it is moved back and forth. Its construction is such that, if any of the parts be broken or injured, they may be readily repaired or replaced.

WATCHMAKER'S TOOL.—Charles Smith, Mount Carmel, Ill. This invention relates particularly to a holder for the movement while securing the hands to the center post, providing a solid anvil support for the post, by means of which the hands can be securely riveted thereto without danger of breaking the center jewel. Means are also provided for holding movements of various sizes by using readily attachable and detachable spacing rings in the box or case.

CONSTRUCTION OF BUREAUS, ETC.—Edward P. Lurker, Evansville, Ind. This invention provides a manner of constructing bureaus, dressing cases, chiffoniers, etc., with sliding drawers, in such a way that the entire article may be finished at one handling, the goods being thus turned out rapidly and the manufacture requiring but little room. With this construction the parting rails are adjustable vertically and laterally, and may be adjusted to the drawers when the bureau is built, to insure a perfect fit, the bottom being attached after the drawers are fitted, and being adjustable up or down.

CUFF BUTTON AND FASTENER.—James F. Poage, Kirksville, Mo. This device has a long flat shank on one end of which the button is held and made integral with the shank, while on the other end are pivoted jaws and a clasp, to secure firm attachment to the sleeve, whereby the cuff may be held in the exact position required, and an expensive cuff button may be used without danger of losing it.

ENVELOPE.—Hugo Roberts y Fernandez, Havana, Cuba. This envelope is made of but one piece of paper, the blank being so formed that glue or cement is not needed in fastening the parts together, but when the parts are united the envelope cannot be opened without tearing some of the parts. The bottom and end flaps each have slots which register when the blank is folded, while the top flap has a cruciform tongue, the vertical member of which passes through the three pairs of slots, the transverse member being wider than the slots, and being folded to pass through an upper slot, then unfolded to prevent withdrawal.

FISHWAY.—William H. Rogers, Amherst, Canada. This invention covers an improvement on a former patented invention of the same inventor, the fishway being so constructed that it may be built below the dam and inclosed in a strong cribwork, securing an entrance for the fish close to the dam, at a point where they will readily find the opening. The upper flume and upper end of the fishway leading into it are constructed to extend any desired distance above the dam, the flume and upper fishway being protected from ice and floods by a suitable covering. The fishway or channels may be applied to a perpendicularly dam or one with considerable batter, the whole structure being firmly anchored to the dam, and the entire lower portion of the cribwork being ordinarily loaded down with stone ballast.

WAGON BRAKE.

Vardiman T. Sweeney, Springfield, Ky. A brake mechanism by which the brake may be applied directly and positively to both the front and the rear wheels of a vehicle, or to the rear wheels only by simply backing the team, is provided by this invention. The device may also be so operated that the team may be backed without applying the brakes, this result being effected by a shifting device in ready reach of the driver. The construction is very simple, and this brake may be readily applied to any form of running gear.

PHOTOGRAPHIC DARK CHAMBER.

Isaac Bryner, Callaway, Neb. A box containing collapsible parts of a dark room is formed of a base board, hinged side boards and top pieces, with end pieces, the inner surface of the side pieces having attached receptacles to receive and hold bottles with chemicals for developing and treating the negatives, while a plate-holding box is held in place by a spring. A compact and simple portable dark room is thus formed for photographic work, one which may be quickly set up and readily taken down and packed in small compass for transportation.

CURTAIN STRETCHER AND CLOTHES HORSE.

Edward N. Kenworthy, Oldham, England. This is a combination device comprising standards adjustably secured to a top bar, with two stretcher bars on opposite sides of the standards. The structure is readily adjustable to various sizes and patterns of curtains, facilitating their stretching and drying, and enabling the curtains to be secured without the use of permanent pins or hooks, while it may also be used as a clothes rack or clothes horse, or to support draught screens or curtains for use in magic lantern lectures.

LACE FASTENER.—Justus W. King, Helena, Mont. This is a device adapted for attachment to a corset, to shoes, or any article in connection with which a lace is employed, automatically locking and holding any portion of a lace brought in engagement with it, and being also capable of adjustment to laces of different thicknesses. The device consists of a circular base of thin metal with a central depressed surface, loosely carrying a spring-controlled locking button, the frictional engagement between the cylindrical portion of the base, the lace and the button effectually preventing the lace from slipping.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

Floor plans and two perspective elevations. Messrs. Lamb & Rich, architects, New York.

2. Plate in colors showing an elegant residence at Montclair, N. J. Perspective view and floor plans. Cost \$7,000 complete. Mr. E. T. Happgood, architect, New York. An excellent design.

3. A house at Montclair, N. J. Two perspective views and floor plans. Cost \$4,750 complete. E. T. Happgood, architect, New York.

4. A Queen Anne cottage recently erected on Chester Hill, Mount Vernon, N. Y., at a cost of \$5,000. Floor plans, perspective elevation, etc.

5. A house for two families erected on Armory Hill at Springfield, Mass., at a cost of \$7,000 complete. Mr. F. R. Richmond, architect, Springfield, Mass. An excellent design. Floor plans and perspective.

6. A model dwelling at Holyoke, Mass. A unique design. Perspective elevation and floor plans.

7. A small cottage and separate summer kitchen. Perspective views and floor plan. Cost for both buildings, about \$1,600.

8. The parsonage at Montclair, N. J., built for the Congregational Church. Cost complete \$15,000. J. C. Cady & Co., architects, New York. Perspective view and floor plans.

9. A handsome residence at South Orange, N. J. Floor plan and perspective elevation.

10. A cottage at Fanwood, N. J., erected at a cost of \$5,100 complete. Perspective elevation and floor plans.

11. Portal of the church of Moret-sur-Loing, France.

12. Illustrations of two handsome English country houses.

13. Miscellaneous contents: The coming age of marble.—White brick.—How to keep out the heat in summer and to keep it in the winter.—House moving.—Tempering tools.—Closet door fastenings.—A right-of-way may be built over.—Stanley plumber and levels, illustrated.—Safety crane, illustrated.—An improved range and heater, illustrated.—Railway window sashes.—A great tunnel.—Inside sliding blinds, illustrated.—About floors.—A fine steel ceiling, illustrated.—An improved door hanger, illustrated.

The Scientific American Architects and Builders Edition is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages: forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fulness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

SCIENTIFIC AMERICAN

BUILDING EDITION.

OCTOBER NUMBER. (No. 84.)

TABLE OF CONTENTS.

1. Elegant plate in colors, showing a handsome residence at Belle Haven Park, Greenwich, Conn., recently erected at a cost of \$18,000 complete.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

"U. S." metal polish. Indianapolis. Samples free. Presses & Dies. Ferracut Mach. Co., Bridgeport, N. J. Spindle Turret Drill Presses. A. D. Quint, Hartford, Ct. Best baling presses. Ryther Mfg. Co., Watertown, N. Y. G. D. Hiscox, 361 Broadway, N. Y., Consulting Engineer. Universal and Centrifugal Grinding Machines. Pedrick & Ayer, Philadelphia, Pa.

Skilled workmen and best materials are the basis for the deserved popularity of Jessop's steel.

Glass grinding and polishing machinery wanted. Apply Tacony Iron and Metal Co., Tacony, Pa.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dodgeon, 24 Columbia St., New York.

Tools for sheet metal goods, presses, lathes, dies, etc. Empire Machine and Tool Co., New Brunswick, N. J.

Screw Sensitive shaft. Invented and manufactured by Stow Mfg. Co., Binghamton, N. Y. See ad., page 254.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sta., New York.

Centrifugal Pumps. Capacity, 100 to 4000 gals. per minute. All sizes in stock. Irvin Van Wie, Syracuse, N. Y.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at Low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

For best hoisting engine. J. S. Mundy, Newark, N. J. Perforated Metals of all kinds, and for all purposes, general or special. Address, stating requirements, The Harrington & King Perforating Co., Chicago.

To Let—A suite of desirable offices, adjacent to the Scientific American offices, to let at moderate terms. Apply to Munn & Co., 361 Broadway, New York.

Fine castings in brass, bronze, composition (gun metal), German silver. Unequalled facilities. Jas. J. McKenna & Bro., 424 and 430 East 23d St., New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4; Munn & Co., publishers, 361 Broadway, N. Y.

Canning machinery outfit complete, oil burners for soldering, air pumps, can wipers, can testers, labeling machines. Presses and dies. Burt Mfg. Co., Rochester, N. Y.

Competent persons who desire agencies for a new popular book of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office, 361 Broadway, New York.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(481) W. P. C. asks (1) what the Harden hand grenade for extinguishing fires are made of. A. Hand grenades for extinguishing fires are made by filling thin spherical glass bottles with a solution of calcium chloride, sal ammoniac or borax. 2. A good insulating material that I can mould out for insulating storage battery plates. A. Use gutta percha. 3. Are there any two acids mixed together that will cause an explosion? A. Yes. 4. Will sulphuric acid set fire to wood? A. Sulphuric acid will char wood by extracting the elements of water. 5. Will the spray from the storage batteries set fire to wood? A. We do not think it would set fire to wood.

(482) O. S. asks: What is the chemical agency of ammonium chloride in the microphone battery? A. The reaction is supposed to be as follows: $2\text{NH}_4\text{Cl} + 2\text{MnO}_2 + \text{Zn} = \text{ZnCl}_2 + 2\text{NH}_3 + \text{H}_2\text{O} + \text{Mn}_2\text{O}_5$. The ammonium chloride acts on the metallic zinc, forming zinc chloride and liberating ammonia.

NEW BOOKS AND PUBLICATIONS.

THE STANDARD ELECTRICAL DICTIONARY. A popular dictionary of words and terms used in the practice of electric engineering. By T. O'Conor Sloane, A. M., E. M., Ph. D. New York: N. W. Henley & Co. 1892. 12mo. Pp. 634. Cloth. Price \$3.

In the Standard Electrical Dictionary we have an important addition to the working library of the amateur and professional electrician. The definitions are illustrated wherever necessary by well executed illustrations, which number in all over three hundred. The work has a very complete index, which renders the use of cross references unnecessary. The author has evidently done his work in a very thorough manner. Take Electricity for example. Here the author has modestly given no definition of his own, but he does not hesitate to give the opinions of seventeen of the best authorities, including many of the foremost electricians of

the world. Many words are given which, owing to the rapid strides of electrical science, are here defined for the first time. There is a clearness in the definitions which recommends the book particularly to the beginner, while the advanced electrician will find such subjects as the theory of dimensions and the dimensions of electrical units fully treated. The work is an invaluable addition to even the smallest of electrical libraries.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 25, 1892.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Air cooler, return, H. B. Roecker. 484,979
Air or gas meter, F. E. Youngs. 485,070. 485,076
Alarm. See Burglar alarm.

Alcohol from liquor casks, apparatus for and method of recovering waste, M. Hickey. 484,963
Animal trap, M. Johnston. 484,964
Anti-friction clasp, W. L. Black. 484,965
Baby bather and crib, combined, A. Baird. 485,081
Baker's and confectioner's depositing apparatus, R. Merson. 484,987
Balancing press, C. E. Whitman. 485,072
Balancing press feed, Kruse & Shipley. 485,045
Battering, finishing grids for secondary, A. F. Madden. 485,128
Batteries, standard cell for electric, H. S. Carter. 485,089
Battery. See Storage battery.

Bearing, machinery, J. D. Brown. 484,966

Bearing, roller, S. B. Bartlett. 485,083

Bed bottom, L. Hinkie. 484,912

Beer, treating, A. Kreusler. 485,012

Belt, lime, D. S. Stewart. 484,974

Berry picker, C. C. Read. 485,057

Bicycle, D. G. Griswold. 484,984

Bicycle support, J. J. Taylor. 484,985

Binder, Bill. 484,986

Boiler, S. F. Woody. 484,987

Boil. See Flower bit.

Block, inside window, J. W. Gilliam. 484,967

Block, See Ceiling block. Differential block.

Board, See Game board.

Boiler, J. Cahill. 485,087

Boiler, fire tube, steam, H. H. Nieman. 485,112

Boiler setting, M. F. Elmer. 485,088

Boiler tube cutter, J. W. Fleming. 484,982

Boilers, expanding device for use in making wash, Anderson & Huntington. 485,078

Book-back, folding, W. H. Sugg. 485,098

Book, duplicating, check, J. Oldfield. 485,132

Book closure, C. Ollendorff. 485,055

Bottle, nursing, O. K. Newell. 484,811

Bottle stopper, J. De Mars. 485,003

Bottle stopper, B. F. Sanborn. 485,138

Bone box. See Cor box. Egg box. Hat box. Letter box.

Box strap, metal, S. C. Cary. 484,950

Brake. See Bicycle brake. Car brake.

Brake handle, Fosburgh & Milligan. 484,964

Brake shoes, art of and apparatus for making, C. T. Schoen. 484,960

Brick and tile machine, J. J. Kulage. 484,967

Bridges, expansion bearing for, G. S. Morrison. 484,971

Bridle bit, L. F. Brown. 484,964

Buckets, automatic latch opener for, C. P. Doie. 484,782

Buckle, G. L. Chapelle. 485,104

Bureau, N. H. Clark. 484,948

Burglar alarm, F. A. Goelse. 484,961

Butter from milk, separating, C. G. P. De Laval. 484,916

Butter package, C. V. Kneeland. 484,975

Butter, nursing, O. K. Newell. 484,903

Bottle stopper, J. De Mars. 485,077

Bottle stopper, B. F. Sanborn. 485,138

Bone box. See Cor box. Egg box. Hat box. Letter box.

Box strap, metal, S. C. Cary. 484,950

Brake setting machine, A. G. Wilkins. 484,933

Cable crossing, H. A. Benedict. 484,977

Calipers, inside, C. F. Osborn. 484,914

Can carrier, S. M. Charies. 484,913

Can carrier, S. M. Charies. 484,915

Can carrier, shipping can. 484,916

Can, C. C. Lockstadt. 484,906

Cape and cap, combined, A. T. Aldrich. 484,945

Car brake, G. H. Elliott. 484,917

Car brake, F. L. Rigo. 484,946

Car brakes, slack adjuster for, W. H. Marshall. 484,800

Car coupling, W. B. Clark. 484,901

Car coupling, Johnson & Olander. 484,902

Car coupling, W. H. Oakes. 484,903

Car coupling, W. H. Oakes. 484,904

Car coupling, F. T. Russell. 485,061

Car coupling, A. Schröder. 485,062

Car door, S. W. Gross. 484,948

Car driving mechanism, C. W. Hunt. 484,911

Car fender or guard, W. W. Baxter. 484,969

Car heating and ventilating system, J. A. Healy. 485,006

Car seat, A. P. Tracy. 485,072

Car seat, adjustable, W. H. Marshall. 484,917

Car seat, adjustable, W. H. Marshall. 484,918

Car seat, adjustable, W. H. Marshall. 484,919

Car seat, adjustable, W. H. Marshall. 484,920

Car seat, adjustable, W. H. Marshall. 484,921

Car seat, adjustable, W. H. Marshall. 484,922

Car seat, adjustable, W. H. Marshall. 484,923

Car seat, adjustable, W. H. Marshall. 484,924

Car seat, adjustable, W. H. Marshall. 484,925

Car seat, adjustable, W. H. Marshall. 484,926

Car seat, adjustable, W. H. Marshall. 484,927

Car seat, adjustable, W. H. Marshall. 484,928

Car seat, adjustable, W. H. Marshall. 484,929

Car seat, adjustable, W. H. Marshall. 484,930

Car seat, adjustable, W. H. Marshall. 484,931

Car seat, adjustable, W. H. Marshall. 484,932

Car seat, adjustable, W. H. Marshall. 484,933

Car seat, adjustable, W. H. Marshall. 484,934

Car seat, adjustable, W. H. Marshall. 484,935

Car seat, adjustable, W. H. Marshall. 484,936

Car seat, adjustable, W. H. Marshall. 484,937

Car seat, adjustable, W. H. Marshall. 484,938

Car seat, adjustable, W. H. Marshall. 484,939

Car seat, adjustable, W. H. Marshall. 484,940

Car seat, adjustable, W. H. Marshall. 484,941

Car seat, adjustable, W. H. Marshall. 484,942

Car seat, adjustable, W. H. Marshall. 484,943

Car seat, adjustable, W. H. Marshall. 484,944

Car seat, adjustable, W. H. Marshall. 484,945

Car seat, adjustable, W. H. Marshall. 484,946

Car seat, adjustable, W. H. Marshall. 484,947

Car seat, adjustable, W. H. Marshall. 484,948

tion, namely, the use of a globe valve at the end of the radiating pipes on each side of the cars. In some cases it has been deemed wise to file a small groove in the valve seat, so that it can never be entirely closed. Such a groove is intended to be large enough to take care of all condensation in mild weather, and in cold weather the trainmen are expected to adjust the opening of the drip valve to suit the amount of condensation. By others it has been thought best to leave the drip valve intact, and to allow trainmen to regulate it for all conditions. This arrangement permits of allowing the condensation in mild weather to partially fill the radiating pipes, and the heat can be then controlled by the amount of condensation allowed to pass off. It can be readily seen that by this arrangement, if half the pipes were filled with water, the steam would only reach and heat the other half of the pipes.

With the present state of invention in relation to traps, I think the plain drip valves have decided advantages. In this connection I would recommend that, where possible, the steam admission and drip pipes should be kept in contact, and covered in the same jacket, and the outlet of the drip be in contact with the three-way valve, or pass through it as is arranged for in one style of three-way valve now on the market.

It may be of interest to know that since last spring a committee representing several of the Vanderbilt roads have had in hand an investigation of the matter of steam heating for cars, and a summary of the results of their work is contained in the following recommendations for adoption:

1. That the "direct" system of steam heating be used for heating coaches.

2. That the "indirect" system of steam heating be used in sleeping cars.

3. That in the "indirect" system, salt water or a non-freezing mixture be used in the circulating pipes.

4. That a three-way valve be uniformly used for controlling the steam in the main train pipe, the parts located inside the car to be uniform, the valve to take a solid (male) wrench, and the marking on the floor plate to be uniform, and to indicate the direction of the main train pipe and the branch supply pipe, and to be similar in size and style to the Martin floor plates, now in general use on the roads represented.

5. That we approve and adopt for general use the style of steam controlling valves as designed and made for our committee by Fairbanks & Co., of Boston,

and by the Safety Car Heating and Lighting Co., of New York.

6. That the use of traps for taking care of the drip be dispensed with.

7. That we use a globe valve for the drip valve, with a small slot filed in the seat of the valve, so it can never be entirely shut off.

8. That two lengths of 2 in. pipe on each side of the car with no spurs under the seats are sufficient for satisfactory heating.

9. That for "indirect" heating, all pipes and connections, except train pipe, shall be maintained inside the car. That the system be limited to one steam valve and one drip valve, placed uniformly in all cars.

10. That at all terminal and junction points, where passenger trains are made up, or cars are likely to be set off, facilities be provided for heating cars by steam, when not in trains. This we consider very essential to the successful heating of cars by steam.

Sea Sickness.

Most of those who have experienced the miseries of sea sickness, however they might differ in minor details of statement, would agree in ascribing this most dispiriting malady to one main cause—the motion of the ship. In so far the whole medical faculty would concur in their decision. This, then, is the central fact which confers upon the disorder its unique position. It is really not a pathological, but a physiological disturbance. It has no natural connection with dyspepsia. The robust and healthy, by a strange contradiction, suffer from it for the time hardly less than the weak and ill. Its variations of intensity are felt to be counterparts of mere bodily oscillation. Some find relief from it in change of posture, others in active occupation, all more or less when their storm-tossed vessel sails under the lee of land. Custom and use commonly secure immunity. These are circumstances which one and all point to mechanical causation as the source of the discomfort. It is the unaccustomed rise and fall, the jerk and relaxation of loosely attached abdominal viscera, mainly, perhaps, but not alone, of the stomach, acting upon the central nervous connections, which must bear the brunt of accusation. It follows that successful treatment cannot be guaranteed by any one method or panacea. Recumbency, pure deck air, moderately firm bandaging of the body, are all useful. Drugs have their place and their par-

tial utility; but, as we have already suggested, there is no remedy equal to a lee shore. Nothing can be much more depressing than sea sickness, and for this reason we should strongly advise all weak persons not to encounter if possible the risk of its occurrence. It is astonishing how soon and how completely those who are favored with a fair measure of constitutional elasticity recover from its depression. In their case the benefits of a sea trip may thus, with compensations of air, diet and appetite, be even enhanced by a few hours of mechanical nausea. It is, in truth, for such persons only that tours of this kind are advisable.—*Lancet.*

The Fastest Steam Launch.

The steam launch Yankee Doodle, probably the fastest boat of its class in the world, was unfortunately destroyed by fire, at Philadelphia, in September last. The boat was originally called the Buzz, built by Mosher, of Amesbury, Mass., but as her speed did not prove satisfactory her original boiler and wheel were removed and new ones substituted by her new owners, Messrs. McBride Brothers, of Philadelphia, Pa. The new boiler was quite remarkable. It had 410 one inch steel tubes, tested to 1,900 pounds to the square inch hydrostatic pressure; 360 feet tubular heating surface; weight, 2,000 pounds; grate surface, 8 feet; steam dome, a peculiar feature, 2 by 4 feet; usual boiler pressure, 150 pounds.

Screw, 34 inches, 5 feet 10 inch pitch; two blades; 550 revolutions per minute.

Engine, 160 horse power; two 8 by 8 inch cylinders.

The hull was 50 feet long, 6½ feet beam; displacement, 4 tons; draught, 15 inches.

Her speediest record was made on the fourth of July last, when, according to the report of the official timers, Messrs. G. S. Carrigan, Dr. G. F. Root, and H. E. McPerson, she ran a mile on the Schuylkill River, on the National Course, in 2 minutes 1½ seconds—almost thirty miles an hour. The timers were not on the boat, and their record is believed to be reliable. We understand the Messrs. McBride intend, during the coming year, to build another boat equal or superior in speed.

CREOSOTED wood has been found to have such excellent lasting qualities that its economical properties have suggested its use for permanent haulage, roads, shaftways, etc., in collieries.

RECENTLY PATENTED INVENTIONS. Engineering.

HYDRAULIC PROPELLER.—John T. Cartairs, Wellington, Canada. Two cylinders containing pistons are, according to this invention, operated simultaneously to alternately draw in and discharge water from either the stern or bow of a vessel, thus propelling it forward or backward as desired. A set of pipes also leads from the gate boxes connected with the cylinders to each side of the vessel, whereby the vessel may be steered by manipulating the gates in the boxes.

Mechanical.

LATHER DOG.—Richmond Parsons, Philadelphia, Pa. This dog is made in two parts, the body part being of U-shape, with teeth on its inner faces, and the bridge piece being adapted to be passed laterally into and out of the body. It can be readily adjusted to different sized work, and applied without removing the centers of the work from the lathe, a clamping screw firmly holding the work after adjustment.

MACHINE FOR NAPPING CLOTH.—George W. Barr and Michael Malony, Webster, Mass. This machine is especially designed for use with the ordinary shearing machine to raise the nap on woolen or worsted goods, and consists of an attachment having oppositely rotating napping cylinders, with needles to raise the nap both ways at the same time, in connection with a tension device to regulate the pressure of the cloth upon the cylinders. The invention also covers a novel construction of the cylinder needles.

SCREW DRIVER.—William E. Daily, Morristown, Tenn. This invention provides a tool of which the bit may be revolved, and the screw forced to place or withdrawn, by means of a crank handle and gearing. The construction is such that the bit may be held to turn only with the shank of the screw driver, of which it constitutes a fixture, while one of the bits may be used with large screws and its other end with smaller ones.

COUPLING.—Irvin P. Doolittle, Redlands, Cal. A means for speedily and firmly connecting sections of pipes, hose, or solid rods, at their ends, and so they may be detached as desired, is provided by this invention. A spiral cam-locking lever is pivoted in a slot on a female coupling section, and has an adjustable interlocking connection, with a channel shoulder on a male coupling section. By means of a joint washer an air tight or water-tight joint is made between the joined coupling sections.

Miscellaneous.

GUN CLEANER.—Charles W. Wunderlich, Washington, Mo. This device has a stock portion with internally threaded socket, forwardly extending spring arms being connected to the peripheral face of the stock, their forward ends contracted and bent to form radial scraper fingers, while a conical expander, having a threaded shank, operates in the threaded socket of the stock. In use the cleaner is attached to the

ramrod of a gun, in the chamber of which it is moved back and forth. Its construction is such that, if any of the parts be broken or injured, they may be readily repaired or replaced.

WATCHMAKER'S TOOL.—Charles Smith, Mount Carmel, Ill. This invention relates particularly to a holder for the movement while securing the hands to the center post, providing a solid anvil support for the post, by means of which the hands can be securely riveted thereto without danger of breaking the center jewel. Means are also provided for holding movements of various sizes by using readily attachable and detachable spacing rings in the box or case.

CONSTRUCTION OF BUREAUS, ETC.—Edward P. Lurker, Evansville, Ind. This invention provides a manner of constructing bureaus, dressing cases, chiffoniers, etc., with sliding drawers, in such a way that the entire article may be finished at one hand. The goods being thus turned out rapidly and the manufacture requiring but little room. With this construction the parting rails are adjustable vertically and laterally, and may be adjusted to the drawers when the bureau is built, to insure a perfect fit, the bottom being attached after the drawers are fitted, and being adjustable up or down.

CUFF BUTTON AND FASTENER.—James F. Poage, Kirksville, Mo. This device has a long flat shank on one end of which the button is held and made integral with the shank, while on the other end are pivoted jaws and a clasp, to secure firm attachment to the sleeve, whereby the cuff may be held in the exact position required, and an expensive cuff button may be used without danger of losing it.

ENVELOPE.—Hugo Roberts y Fernandez, Havana, Cuba. This envelope is made of but one piece of paper, the blank being so formed that glue or cement is not needed to fasten the parts together, but when the parts are united the envelope cannot be opened without tearing some of the parts. The bottom and end flaps each have slots which register when the blank is folded, while the top flap has a cruciform tongue, the vertical member of which passes through the three pairs of slots, the transverse member being wider than the slots, and being folded to pass through an upper slot, then unfolded to prevent withdrawal.

FISHWAY.—William H. Rogers, Amherst, Canada. This invention covers an improvement on a former patented invention of the same inventor, the fishway being so constructed that it may be built below the dam and inclosed in a strong cribwork, securing an entrance for the fish close to the dam, at a point where they will readily find the opening. The upper flume and upper end of the fishway leading into it are constructed to extend any desired distance above the dam, the flume and upper fishway being protected from ice and floods by a suitable covering. The fishway or channels may be applied to a perpendicularly dam or one with considerable batter, the whole structure being firmly anchored to the dam, and the entire lower portion of the cribwork being ordinarily loaded down with stone ballast.

WAGON BRAKE.—Vardiman T. Sweeney, Springfield, Ky. A brake mechanism by which the brake may be applied directly and positively to both the front and the rear wheels of a vehicle, or to the rear wheels only by simply backing the team, is provided by this invention. The device may also be so operated that the team may be backed without applying the brakes, this result being effected by a shifting device in ready reach of the driver. The construction is very simple, and this brake may be readily applied to any form of running gear.

PHOTOGRAPHIC DARK CHAMBER.—Isaac Bryner, Callaway, Neb. A box containing collapsible parts of a dark room is formed of a base board, hinged side boards and top pieces, with end pieces, the inner surface of the side pieces having attached receptacles to receive and hold bottles with chemicals for developing and treating the negatives, while a plate-holding box is held in place by a spring. A compact and simple portable dark room is thus formed for photographic work, one which may be quickly set up and readily taken down and packed in small compass for transportation.

CURTAIN STRETCHER AND CLOTHES HONSE.—Edward N. Kenworthy, Oldham, England. This is a combination device comprising standards adjustably secured to a top bar, with two stretcher bars on opposite sides of the standards. The structure is readily adjustable to various sizes and patterns of curtains, facilitating their stretching and drying, and enabling the curtains to be secured without the use of permanent pins or hooks, while it may also be used as a clothes rack or clothes horse, or to support draught screens or screens for use in magic lantern lectures.

LACE FASTENER.—Justus W. King, Helena, Mont. This is a device adapted for attachment to a corset, to shoes, or any article in connection with which a lace is employed, automatically locking and holding any portion of a lace brought in engagement with it, and being also capable of adjustment to laces of different thicknesses. The device consists of a circular base of thin metal with a central depressed surface, loosely carrying a spring-controlled locking button, the frictional engagement between the cylindrical portion of the base, the lace and the button effectually preventing the lace from slipping.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

SCIENTIFIC AMERICAN BUILDING EDITION.

OCTOBER NUMBER.—(No. 84.)

TABLE OF CONTENTS.

1. Elegant plate in colors, showing a handsome residence at Belle Haven Park, Greenwich, Conn., recently erected at a cost of \$18,000 complete.

Floor plans and two perspective elevations. Messrs. Lamb & Rich, architects, New York.

2. Plate in colors showing an elegant residence at Montclair, N. J. Perspective view and floor plans. Cost \$7,000 complete. Mr. E. T. Hapgood, architect, New York. An excellent design.

3. A house at Montclair, N. J. Two perspective views and floor plans. Cost \$4,750 complete. E. T. Hapgood, architect, New York.

4. A Queen Anne cottage recently erected on Chester Hill, Mount Vernon, N. Y., at a cost of \$5,000. Floor plans, perspective elevation, etc.

5. A house for two families erected on Armory Hill at Springfield, Mass., at a cost of \$7,000 complete. Mr. F. R. Richmond, architect, Springfield, Mass. An excellent design. Floor plans and perspective.

6. A model dwelling at Holyoke, Mass. A unique design. Perspective elevation and floor plans.

7. A small cottage and separate summer kitchen. Perspective views and floor plan. Cost for both buildings, about \$1,000.

8. The parsonage at Montclair, N. J., built for the Congregational Church. Cost complete \$15,000. J. C. Cady & Co., architects, New York. Perspective view and floor plans.

9. A handsome residence at South Orange, N. J. Floor plans and perspective elevation.

10. A cottage at Fanwood, N. J., erected at a cost of \$5,100 complete. Perspective elevation and floor plans.

11. Portal of the church of Moret-sur-Loing, France.

12. Illustrations of two handsome English country houses.

13. Miscellaneous contents: The coming age of marble.—White brick.—How to keep out the heat in summer and to keep it in in the winter.—House moving.—Tempering tools.—Closet door fastenings.—A right-of-way may be built over.—Stanley plumb and levels, illustrated.—Safety crane, illustrated.—An improved range and heater, illustrated.—Railway window sashes.—A great tunnel.—Inside sliding blinds, illustrated.—About floors.—A fine steel ceiling, illustrated.—An improved door hanger, illustrated.

The Scientific American Architects and Builders Edition is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fulness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
381 Broadway, New York.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

U. S. metal polish, Indianapolis. Samples free.
Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.
Spindle Turret Drill Presses. A. D. Quint, Hartford, Ct.
Best baling presses. Ryther Mfg. Co., Watertown, N. Y.
G. D. Hiscox, 361 Broadway, N. Y., Consulting Engineer.
Universal Centrifugal Grinding Machines.

Pedrick & Ayer, Philadelphia, Pa.
Skilled workmen and best materials are the basis for the deserved popularity of Jessop's steel.

Glass grinding and polishing machinery wanted. Apply Tacony Iron and Metal Co., Tacony, Pa.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. H. Dodgeon, 24 Columbia St., New York.

Tools for sheet metal goods, presses, lathes, dies, etc. Empire Machine and Tool Co., New Brunswick, N. J.

Stow flexible shaft. Invented and manufactured by Stow Mfg. Co., Binghamton, N. Y. See adv., page 254.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laithe and Canal Sta., New York.

Centrifugal Pumps. Capacity, 100 to 4000 gals. per minute. All sizes in stock. Irvin Van Wie, Syracuse, N. Y.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, after press pumps, etc.

Split Pulleys at Low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

For best bolting engine. J. S. Mundy, Newark, N. J.
Perforated Metals of all kinds and for all purposes, general or special. Address, stating requirements, The Harrington & King Perforating Co., Chicago.

To Let—A suite of desirable offices, adjacent to the Scientific American offices, to let at moderate terms. Apply to Munn & Co., 361 Broadway, New York.

Fine castings in brass, bronze, composition (gun metal), German silver. Unequalled facilities. Jas. J. McKenna & Bro., 434 and 436 East 23d St., New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4; Munn & Co., publishers, 361 Broadway, N. Y.

Canning machinery out fits complete, oil burners for soldering, air pumps, can wipers, can testers, labeling machines. Presses and dies. Burt Mfg. Co., Rochester, N. Y.

Competent persons who desire agencies for a new popular book, of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office, 361 Broadway, New York.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(4581) **W. P. C.** asks (1) what the Harden hand grenade for extinguishing fires are made of. A. Hand grenades for extinguishing fires are made by filling thin spherical glass bottles with a solution of calcium chloride, sal ammoniac or borax. 2. A good insulating material that I can mould out for insulating storage battery plates. A. Use gutta percha. 3. Are there any two acids mixed together that will cause an explosion? A. Yes. 4. Will sulphuric acid set fire to wood? A. Sulphuric acid will char wood by extracting the elements of water. 5. Will the spray from the storage batteries set fire to wood? A. We do not think it would set fire to wood.

(4582) **O. S.** asks: What is the chemical agency of ammonium chloride in the microphone battery? A. The reaction is supposed to be as follows: $2\text{NH}_4\text{Cl} + 2\text{MnO}_2 + \text{Zn} = \text{ZnCl}_2 + 2\text{NH}_3 + \text{H}_2\text{O} + \text{Mn}_2\text{O}_3$. The ammonium chloride acts on the metallic zinc, forming zinc chloride and liberating ammonia.

NEW BOOKS AND PUBLICATIONS.

THE STANDARD ELECTRICAL DICTIONARY. A popular dictionary of words and terms used in the practice of electric engineering. By T. O'Conor Sloane, A. M., E. M., Ph.D. New York: N. W. Henley & Co. 1892. 12mo. Pp. 624. Cloth. Price \$3.

In the Standard Electrical Dictionary we have an important addition to the working library of the amateur and professional electrician. The definitions are illustrated whenever necessary by well executed illustrations, which number in all over three hundred. The work has a very complete index, which renders the use of cross references unnecessary. The author has evidently done his work in a very thorough manner. Take Electricity for example. Here the author has modestly given no definition of his own, but he does not hesitate to give the opinions of seventeen of the best authorities, including many of the foremost electricians of

the world. Many words are given which, owing to the rapid strides of electrical science, are here defined for the first time. There is a clearness in the definitions which recommends the book particularly to the beginner, while the advanced electrician will find such subjects as the theory of dimensions and the dimensions of electrical units fully treated. The work is an invaluable addition to even the smallest of electrical libraries.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 25, 1892.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Air cooler, return, H. B. Roelker. 484,979

Air or gas meter, F. E. Youngs. 485,076

Alcohol from liquor casks, apparatus for and method of recovering waste, M. Hickey. 484,963

Animal trap, M. Johnston. 484,799

Antifreeze clamp, W. L. Black. 484,947

Baby tender and crib, combined, A. Baird. 485,081

Bag. See Nursery bag.

Baking and confectioner's depositing apparatus, R. Meggs. 484,907

Baling press, C. E. Whitman. 485,077

Bating press feeder, Kruse & Shipley. 485,045

Battering, finishing gride for secondary, A. F. Madden. 485,128

Batteries, standard cell for electric, H. S. Carter. 485,089

Battery, secondary. 485,089

Bearing, machine, J. D. Brown. 484,903

Bearing, roller, F. B. Bierleit. 484,904

Bed bottom, L. Hinke. 484,912

Bear, treating, A. Kreusler. 485,012

Beet, link, D. Stewart. 484,827

Berry picker, C. C. Head. 485,057

Bicycle, Dey & Griswold. 484,857

Bicycle, A. H. Kempe. 484,857

Bicycle brake, R. C. Fay. 484,841

Bicycle support, J. J. Muller. 484,941

Bird holder, for the body. 484,904

Bit. See Bridge bit.

Block, inside window, J. W. T. Gilliam. 484,927

Block, See Ceiling block. Differential block. 484,927

Book board. See Game board.

Book, folding, W. H. Sugg. 485,087

Book, duplicating check, J. Oldfield. 485,068

Book closure, C. Ollendorf. 485,132

Bottle, nursing, O. K. Newell. 484,811

Bottle stopper, J. De Mars. 485,065

Bottle stopper, B. F. Sanborn. 485,139

Box. See Core box. Egg box. Hat box. Letter box. 484,927

Box strap, metal, S. C. Cary. 485,150

Brake, See Bicycle brake. Car brake. 484,964

Brake handle, Footbrake & Milligan. 484,964

Brake shoe, art of and apparatus for making, C. T. Schoen. 484,966

Brick and tile machine, J. J. Kulage. 484,966

Brick press, J. J. Kulage. 484,966

Bridges, expansion bearing, G. S. Morison. 484,966

Buckbit, atomized match opener for, C. P. Dule. 484,966

Buckle, L. H. Chapelle. 484,966

Bureau, N. H. Clark. 484,966

Burglar alarm, F. A. Goeze. 484,966

Butter from milk, separating, C. G. P. De Laval. 484,916

Butter package, F. C. Kneeland. 484,916

Button, H. M. Nester. 485,111

Button, A. E. Newcomb. 484,911

Button cutting machines, etc., tool holder for, F. W. M. Koch. 484,911

Button fastening, E. A. Giles. 484,945

Button machine, A. Phelps. 484,976

Button setting machine, A. G. Wilkins. 484,986

Cable crossing, H. A. Benedict. 484,777

Calculating machine, F. C. Osborn. 484,914

Calipers, inside, R. C. Nugent. 484,914

Can. See Paper can. Shipping can. 484,900

Can, C. C. Lockstadt. 484,900

Cape and cap, combined, A. T. Aldrich. 484,900

Car brake, F. L. Elliott. 484,900

Car brakes, slack adjuster for, W. H. Marshall. 484,886

Car coupling, W. B. Clark. 484,997

Car coupling, Johnson & Olander. 484,997

Car coupling, W. M. Wiggett. 484,997

Car coupling, H. B. Oakes. 484,997

Car coupling, F. Russell. 484,997

Car driving mechanism, G. W. Schroeder. 485,007

Car driving mechanism, C. W. Hunt. 484,914

Car heating and ventilating system, J. A. Healy. 485,008

Car seal, A. P. Travis. 485,070

Car sleep, A. C. Charles. 485,070

Carbonating liquids, art of and apparatus for, C. A. & S. Schleifer. 484,949

Carving, J. Clineman. 484,949

Card, playing, J. W. Hyatt. 484,789

Carding engine, W. P. Canning. 484,726

Carding engine, S. F. Canning. 484,746

Carriage lock for the wheels of children's, J. A. Birkholz. 484,973

Carrier. See Egg carrier. Hose pipe carrier. 484,945

Carrying machine, M. A. T. Twitchell. 484,966

Cash indicator and recorder, G. R. Burt. 485,066

Cash register and indicator, E. H. Murdoch. 484,887

Ceiling block, J. J. Green. 485,181

Chain making machine, F. F. Ellis. 484,700

Chocolate, etc., apparatus for automatically compressing, P. Guerin. 484,949

Cigarette machine, V. H. Arquer. 484,949

Cigarette smoking device, E. C. Powers. 485,000

Cigarette smoking device, F. C. Powers. 485,000

LARKIN'S BRASS AND IRON FOUNDER.

A new and thoroughly revised Union. Just Ready.

THE PRACTICAL

BRASS AND IRON FOUNDER'S GUIDE

A Treatise on Brass Founding, Moulding, the Metals and their Alloys, etc. By JAMES LARKIN, late Conductor of the Brass Foundry Department in the Penn Works, Philadelphia. A new revised and greatly enlarged edition. In one volume. \$100. 400 pages.

Price \$2.50 by mail, free of postage to any address in the world.

CONTENTS.—Among the most important and entirely new sections of this edition of this valuable and popular book are the following: Behavior of Metals and Alloys in Melting and Casting; Malleable Iron Castings; Wrought Iron or Malleable Castings; Manufacture of Steel Castings; Casting of Brass; Casting of Bronze; Bell Founding; Chill Casting; Casting without Core; Casting on to other Metals; Casting Iron and other Metals upon Laces, Embroideries, Fern Leaves and other Combustible Materials; Some Modern Bronzes.

1st Descriptive circular, giving full table of contents of the above book, sent free to any one who will send his address.

Our new revised Descriptive Catalogue of Practical and Scientific Books, 36 pages, free and our Catalogue of Books on Steam and Gas Engines, Mining Machinery, and Dynamical Engineering, List of Books on Electricity, Moulding, Founding, Pattern Making, Metal Working, etc., and other Catalogues, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
510 Walnut St., Philadelphia, Pa., U. S. A.BARR'S Book on Steam Boilers, cloth, \$3.00.
"Combustion of Coal, cloth, \$2.50.
are recognized Standard Text Books on these important subjects. New edition just ready. D. Van Nostrand Company, New York. Henry Carey Baird Company, Philadelphia. Baker-Randolph Co., Publishers, Indianapolis and Chicago.POPULAR AND INSTRUCTIVE BOOKS
FOR ENGINEERS AND FIREMEN.

By STEPHEN ROPER, Engineer.

Embracing all branches of Steam Engineering. They are the only books of the kind ever published in this country, and are so plain that any engineer or fireman can easily understand them.

Descriptive Catalogue mailed free.

EDWARD MEERS, Publisher,
No. 1012 Walnut Street, Philadelphia, Pa.FIREMEN STUDY
MECHANICS AT HOME.
Send for FREE Circular to
The Correspondence School of Mechanics, Scranton, Pa.GUITARS MANDOLINS
The Marquette, Quarter-sawn Spruce \$7.00
The Lakeside, Variegated Birds-Eye Maple \$13
The Lakeside, Maple and Mahogany \$15
The Arion, Solid Mahogany \$11.00
The Conservatory, Solid Rosewood \$15.00
The Conservatory, Solid Rosewood \$10
Fully warranted and the best for the price the world affords. We manufacture all the component parts and are the largest makers on the globe. 100,000 of our instruments now in use. Sold by all leading dealers. Genuine have name burned on the inside. Take no other. Illustrated pamphlet mailed free.
LYON & HEALY, 156 to 164 State St., Chicago.212° FAHR THE STEAM JACKET
FEED WATER BOILER & PURIFIER
BOILS THE WATER
W. M. BARAGWANATH & SON
46 W DIVISION ST. CHICAGO.
SEND FOR CATALOGUE.Incubators, Only \$12.00
F. WILLIAMS, Bristol, Ct.

HOW TO MAKE A DYNAMO.

By EDW. TREVERT.
Illustrated with full working drawings. Capacity 1/2 H. P.
Price 10c., postpaid.

SEWING MACHINE MOTOR FOR AMERICA.—By C. D. Parkhurst. Description of a very simple and effective motor with laminated armature, of sufficient power to actuate a sewing machine. With 11 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 739. Price 10 cents. To be had at this office and from all newsdealers.

DEAFNESS & HEAD NOISES CURED
By Peck's Invisible Tumid Ear Cushions. Whistling
head. Successful when all remedies fail. Sold
only by F. H. Hoxie, 888 B'way, N.Y. Write for book of proofs FREE.

TO BUSINESS MEN

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN, when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

For rates see top of first column of this page or address MUNN & CO., Publishers.
361 Broadway, New York.

The 1892 Model Remington Typewriter

For Ease and Convenience of Operation, Simplicity of Design
and Durability of Construction, is

UNEQUALLED

SEND FOR CATALOGUE.

WYCKOFF, SEAMANS & BENEDICT, 327 Broadway, N. Y.

Watchman's Improved Time Detector
with 12 or 24 Keys, with
Safety Lock attachment.
Patented 1875-6-7. My inventions,
and will sue all concerns selling
or using the Safety Lock attachment,
according to Decision of Circuit
Court of U. S. for
S. D. of N. Y.
Send for circulars to
E. IMHAUSER, 206 Broadway, New York. P. O. Box 295.CHUCKS. Catalogue No. 12, just issued
with over 40 new illustrations
and price list. Address,
The Cushman Chuck Co., Hartford, Conn.PLAYS. Dialogues, Speakers, for School,
Club and Parlor. Catalogue free.
T. S. DENISON, Publisher, Chicago.GYMNASIACS FOR GIRLS.—AN INTER-
ESTING account of the course of instruction given
at the Berkeley Athletic Club for Ladies. With 15 illustrations.
Contained in SCIENTIFIC AMERICAN SUPPLEMENT,
No. 733. Price 10 cents. To be had at this
office and from all newsdealers.ALL ARITHMETICAL PROBLEMS
solved rapidly and accurately
by the Comptometer. Saves
60 per cent of time and entirely
relieves mental and nervous strain.
Adapted to all commercial and scientific
computation. Why don't you
get one? Write for pamphlet.
FELT & TARRANT MFG. CO.
52-56 ILLINOIS ST. CHICAGO.ELECTRIC POWER APPARATUS,
FOR EVERY VARIETY OF MECHANICAL WORK.

SAFE, SURE, RELIABLE.

ESTIMATES FURNISHED.

SEND FOR CATALOGUES.

THOMSON-HOUSTON MOTOR CO.,

620 ATLANTIC AVENUE, BOSTON, MASS.

HARRISON CONVEYOR!
For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.
Send for Circulars. BORDEN, SELLECK & CO., Sole
Manufacturers, Chicago, Ill.

BOOKS.

Our entirely new 116 page Catalogue of Scientific and Technical Books, both American and Foreign, just issued, containing a record of nearly 1000 books, and embracing more than 30 different subjects. A valuable and new plan with cross references and author's index, will be mailed free to any address in the world on application. Address

MUNN & CO.,
Publishers "Scientific American,"
No. 361 BROADWAY, NEW YORK.STEVENS PATENT
SPRING INSIDE CALIPERS
Lender, No. 72.
Price, by mail, postpaid.4 inch... \$0.75 5 inch... \$0.80 6 inch... \$0.85
These goods excel for neatness and fine finish,
other make. Ideal and Leader Spring Di-
viders and Calipers. Ideal Surface Gauges,
Calipers, and Fine Machinist Tools.Illustrated catalogue free to all.
J. STEVENS ARMS & TOOL CO.,
P. O. Box 290, Chicopee Falls, Mass.IMPROVED CHARTER
GAS ENGINES.
USING GASOLINE, COAL GAS, NATURAL GAS,
PRODUCER GAS.
RELIABLE, SAFE, ECONOMICAL, SIMPLE,
DELICATE PARTS.
H. W. CALDWELL & SON
SOLE MFRS.
EAST 105th ST., WASHINGTON & UNION STS., CHICAGO, ILL.FOR SALE.—6 volumes of the Scientific American
commencing vol. 1, new series, well
bound, in excellent condition, for public or private
library. Price \$75. Address H. Fisher, Canton, Ohio.THE BEST LOOSE PULLEY OILER
IN THE WORLD.
VANDUZEN PAT. L. PUL. OILER
Keeps Pulley oiled 2 to 4 weeks with one
filling. Costs 25, 30, 40, 50, 65 and 95 cents
each. Send Price and TRY ONE.
State diameter and speed of Pulley. Will
send Catalogue free. Mention this paper.
The VANDUZEN & TIPTON CO., Cincinnati, O. U.S.A.LIFE SAVING DEVICES.—A COL-
lection of suggestions of devices for communicating
between the shore and stranded vessels, offered to the
London Daily Graphic by various correspondents. With
73 illustrations. Contained in SCIENTIFIC AMERICAN
SUPPLEMENT, Nos. 848, 849, 850, 851, 852,
853 and 854. Price 10 cents each, or 70 cents for the
series. To be had at this office and from all newsdealers.CELLULOID ZAPON CO.
41 BARCLAY ST. NEW YORK.
GUM LACQUERS—BRILLIANT AND DEAD BLACKS—SHELLACCS &
MANUFACTURERS OF
CELLULOID LACQUERS
AND VARNISHES FOR METAL AND WOOD
GUM LACQUERS—BRILLIANT AND DEAD BLACKS—SHELLACCS &
PAINTS.

PROPOSALS.

UNITED STATES ENGINEER OFFICE, NO. 73

Fourth Street, Portland, Oregon, September 15, 1892.
Sealed proposals, in duplicate, will be received at this office until the 1st instant, m. standard time, November 15,
and then publicly opened, for furnishing all the material and labor necessary to complete the present project for improving canal at the cascades of the Columbia River, Oregon. Preference will be given to materials of domestic production or manufacture, conditions of quality and price (import duties included) being equal. Attention is invited to Acts of Congress, approved February 28, 1885, and February 28, 1886, Vol. 1,
Sec. 20 and 21, and 41st Statute at Large. The Government reserves the right to reject any and all proposals, also to waive any informalities, specifications, blank forms, and all available information will be furnished on application to this office. Persons intending to submit proposals must visit the locality of the works.
THOS. H. HANDBURY, Major, Corps of Engineers,
U. S. A.

CLARK'S

WOOL WASHERS,
WARP DYEING AND SIZING MACHINES,
PATENT RUBBER COVERED SQUEEZE ROLLS,
POWER WRINGERS FOR HOSIERY AND
VARN DYEING,
DRYING AND VENTILATING FANS,
WOOL AND COTTON DRYERS, Etc.
Catalogues free.CEO. P. CLARK
Box L. Windsor Locks, Conn.THE KNAAPP ELECTRICAL
CHICAGO, ILL. MANUFACTURERS
ELECTRIC LIGHT SUPPLIES
TELEGRAPH ALARM & FIRE INSULATED COPPER & BARE WIRE
ANNUNCIATORS, BURGLAR ALARMS, BELL BATTERIES
EVERYTHING ELECTRICAL

HOW TO MAKE A STORAGE BATTERY.—By G. M. Hopkins. Directions for making a Planté battery and for charging the same. With 4 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 843. Price 10 cents. To be had at this office and from all newsdealers.

If you are interested in
ELECTRICITY
send for our special Price List 2.
BELLS, BATTERIES, PUSHES,
WIRE, MOTORS,
And a full line of general
ELECTRICAL SUPPLIES,
STANLEY & PATTERSON,
Electrical House Furnishings,
22 & 24 Frankfort St., N. Y. City.RAILWAY & STEAM FITTERS SUPPLIES
Rue's Little Giant Injector.
SCREW JACKS, STURTEVANT BLOWERS, &c.
JOHN S. URQUHART, 46 Cortlandt St., N. Y.WE SEND FREE
with this beautiful Organ an Instruction
Book and Handbook, upholstered Steel
The organ has 11 stops, 8 octaves, and is
made of Solid Walnut. Warranted by us for
15 years. We only charge \$45 for this beautiful
instrument. Send to-day for FREE illustrated
catalogue. OXFORD MFG. CO. Chicago.ALUMINUM. AN INTERESTING DE-
scription of the various methods of manufacturing the
metal, chemical and electrical, with special reference to
the following methods. With 6 figures. Contained in
SCIENTIFIC AMERICAN SUPPLEMENT, No. 733. Price
10 cents. To be had at this office and from all news-
dealers.BOX TOOL POST WRENCHES,
Drop Forged from Bar Steel.

The BILLINGS & SPENCER CO., Hartford, Conn.

HAVE YOU READ
Experimental
Science?This new book, by Geo. M. Hopkins, is just what
you need to give you a good general knowledge of
Physical Science. No one having the spirit of the
times can afford to be without the kind of scientific
information contained in this book. It is not
only instructive, but entertaining.Over 200 pages: 600 fine cuts; substantially bound.
Price by mail, \$4.00.Send for illustrated circular.
MUNN & CO., Publishers,
Office of the SCIENTIFIC AMERICAN,
361 BROADWAY, NEW YORK.

Advertisements.

Inside Page, each insertion - - - 75 cents a line
Back Page, each insertion - - - \$1.00 a line
The above are charges per single line—about eight words per line, and are written in the width of the line, and is in a sans-serif type. Engravings may head advertisements at the same rate per single line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.



"Spur Pointed" Wood Screws.

Patented May 15, 1891; Oct. 23, 1891;
Aug. 18, Oct. 21, 1891; April 7, May 12, 1891;
July 10, 1892.

Its Advantages are:
1. Stronger than a common screw.
2. Uniform and wide slot.
3. Requires the use of but one bit in hard wood.

4. Inserted easier.
5. Centralized point.
6. Superior holding power.

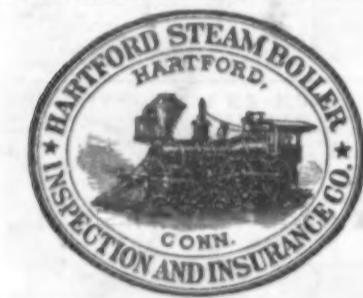
7. The screw being Cold Forged, instead of Cut, leaves on its entire surface a metallic skin.

Send for samples to

AMERICAN SCREW CO.
PROVIDENCE, R. I.

B. C. DAVIS, Counsellor at Law,
116 Remond Street, Brooklyn, New York,
Corporation, John Stock Company, Syndicates
organized to develop mining, industrial, manufacturing
and business enterprises and patents—counselled, ad-
vised and financially shaped to interest capital.

OIL OR GREASE:
Whatever you prefer, we can supply you with the most modern, efficient and economical Capse. It will pay you to investigate our numerous styles. Why not send for our catalogue of all sizes. Lubricators, Oil and Grease Capse, etc. We are convinced that we are headquarters. Any dealer can supply you with "Lankensheimer" goods. Mention the Lankensheimer Brass Mfg. Co., Cincinnati, Ohio, U. S. A.



The Pivot of Fortune:

a seized moment.

To possess that single instant when it comes, to command it deliberately with sheer purpose, and turn it to your gain—that is power: it lies in having time; carrying it in your pocket, keeping an eye upon it. In short, the pivot of fortune is a watch pivot.

It turns against a tiny jewel—a garnet or sapphire. There are several of them in every good watch. All the new, quick-winding Waterburys have jeweled movement. This, and remarkably close adjustment, are what make it an accurate time-keeper. \$4 to \$15. All jewelers sell it in all styles.

N.Y.

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had forty-five years' experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Covenants, Copyrights, for Inventors, Labels, Descriptions, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Descriptions, Appeals, Desenses, Infringements, Letters Patent, Rejected Cases. Hints on the sale of Patents, etc.

We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing Patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents.

361 Broadway, New York.

BRANCH OFFICES.—No. 409 and 410 F Street, Pe-
tico Building, near 11th Street, Washington, D. C.

THE BRIDGEPORT WOOD FINISHING CO.
—MANUFACTURERS OF—
WHEELER'S PATENT WOOD FILLER.
BREINIG'S LITHOGEN SILICATE PAINT.
ADAPTED TO ALL CLIMATES ESPECIALLY MARINE EXPOSURES.
GRANVILLE M. BREINIG,
GENERAL AGENT & SUPT.
Branch Offices and Warehouses—CHICAGO, 311 East Randolph Street.
NEW YORK, 360 Pearl St.—ST. LOUIS, 301 St. Charles St.—BOSTON, 25 Oliver St.

PAMPHLET GIVING DIRECTIONS FOR FINISHING HARD WOOD FREE TO ANY ADDRESS.

KODAKS

For Snap-Shots Out-Doors,
For Time Exposures In-Doors,
For Flash-Lights at Night.

The Junior are the most compact cameras made. Perfectly adapted to hand or tripod use. Can be used with roll films or glass plates. Fitted with focusing index and counter for exposures.

\$40 and \$50.

Send for Catalogue.
EASTMAN KODAK CO.,
Rochester, N. Y.

PATENT JACKET KETTLES

Plain or Porcelain Lined.
Tested to 100 lb. pressure. Send for Lists.
BARROWS-SAVERY CO.,
8, Front & Reed Streets, Philadelphia, Pa.

MECHANICS' TOOLS.

If you are interested in Tools as a manufacturer or amateur, you should have a copy of our new catalogue. Our 1892 edition is a very elaborate one. Price 25c. It is handsomely bound in cloth. This will be sent to any part of the world, prepaid, on receipt of \$1.00, and the money thus paid will be refunded with the first purchase amounting to \$1.00 or over. Every manufacturer and amateur should have this catalogue, even if they do not intend buying their Tools and Supplies of us.

MONTGOMERY & CO., Fine Tools,
105 Fulton Street, New York City, N. Y.

H. W. JOHNS'



Non-Conducting Coverings for Steam and Hot Water Pipes, Boilers, etc.
READILY ATTACHED OR REMOVED BY ANY ONE.
ASBESTOS BOILER COVERINGS.

We are prepared to take contracts for applying Steam Pipe and Boiler Coverings in any part of the United States.

H. W. JOHNS' MANUFACTURING COMPANY,
H. W. Johns' Asbestos Millboard, Sheetings, Building Felts, Fire-Proof Paints, Liquid Paints,
Asbestos Roofing, Etc.
87 Maiden Lane, N. Y. JERSEY CITY, CHICAGO, PHILADELPHIA, BOSTON, ATLANTA, LONDON.

CROCKER-WHEELER ELECTRIC CO.
ELECTRIC MOTORS

FOR ALL SPECIAL WORK.
ACKNOWLEDGED TO BE THE STANDARD FOR ALL HIGH-CLASS
WORK WHERE POWER IS REQUIRED.
430 WEST FOURTEENTH STREET, NEW YORK.

THE AMERICAN BELL TELEPHONE CO.
95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones, infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

THE HUB FRICTION CLUTCH,

applied to Pulleys, Gears, Springs, etc. of Wheels, Reversible Couplings, the most simple, effective, durable and economical Clutch on the market. Made in sizes to transmit from 2 up to 1000 h. p., at slow or fast speed. Over 10,000 in use. Write for cuts, description, price list and dimensions from the makers, The John W. Kane Co.,
Woolen Machinery Co.,
411-421 Race St., Phila., Pa.

GENERAL ELECTRIC COMPANY.

EDISON and THOMSON-HOUSTON SYSTEMS.
INCANDESCENT and ARC LIGHTING.
STREET RAILWAYS.
TRANSMISSION OF POWER.
MINING BY ELECTRICITY.

Send for our NEW Catalogue.
BRANCH OFFICES:

20 Atlantic Avenue.....Boston, Mass.

111 and 115 Adams Street.....Chicago, Ill.

264 West Fourth Street.....Cincinnati, O.

Gould Building.....Atlanta, Ga.

15 First Street.....New York.

2 Broome Street.....New York.

106-108 Greenwich Street.....St. Paul, Minn.

Masonic Temple.....Denver, Colo.

15 Francisco Street.....San Francisco, Cal.

GRAVES ELEVATORS.

INDUSTRIAL, MANUFACTURING,
AND UNCURRENT
SECURITIES DEAL IN.
WORDEN & FANSHAW, 9 WALL ST., NEW YORK.

GALVANIZED
GEARED AEROMOTOR

Re-designed and much improved, furnishes power to PUMP, GRIND, CUT FEED, and SAW WOOD.

Price Cut to \$75
For 12-ft. Steel
Geared
Aermotor.
Does the work of 4 horses at half the cost of one, and is always harnessed and never gets tired. With our Steel Stub Tower it is easy to put on barn. Send for elaborate designs for putting power in barn. 12th & Rockwell Sts., Chicago, & 25 Brado St., San Francisco.

THE
SCIENTIFIC AMERICAN

ESTABLISHED 1846.
The Most Popular Scientific Paper in the World
Only \$3.00 a Year, Including Postage.
Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of patents each week.

TERMS OF SUBSCRIPTION.—One copy of the SCIENTIFIC AMERICAN will be sent for one year—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of three dollars by the publishers; six months, \$1.50; three months, \$1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

THE
Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archaeology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, \$5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for \$7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check.

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors, and with other fine engravings; illustrating the most interesting examples of modern architectural construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all news-dealers. \$2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING INKS.

The SCIENTIFIC AMERICAN is printed with CHAS. E. NEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 6 Rose St., opp. Duane, New York.